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ON THE

ANATOMICAL CAUSES

AND THE NATURE OF

SYMPATHETIC OPHTHALMIA

BY

DR. ADOLF ALT,
OF NEW YORK.

Reprinted from the "Archives of Ophthalmology and Otology," Nos. 3 and 4, 1876.

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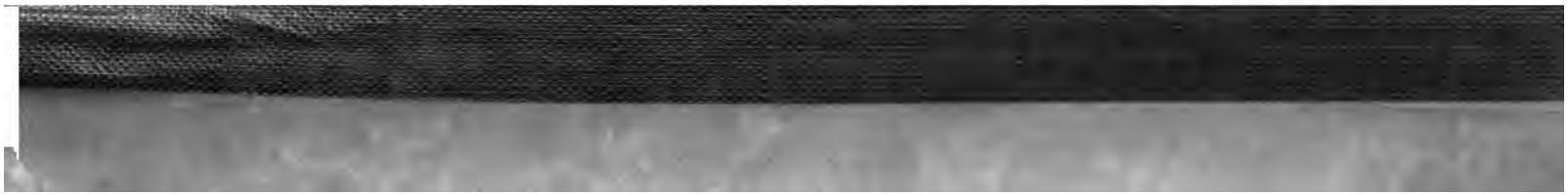
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ON THE ANATOMICAL CAUSES AND THE NATURE OF SYMPATHETIC OPHTHALMIA.

By Dr. ADOLF ALT, of New York.

THE subject of sympathetic ophthalmia has received the greatest attention, but mainly from a clinical standpoint, whereas its anatomical peculiarities have been singularly neglected. It was through the liberality of some of my colleagues that 32 eyes were placed at my disposal, which had been enucleated on account of sympathetic affection of the fellow eyes. In addition to these cases, examined by myself, I have compiled 78 others, selecting the most detailed ones, from the literature which was at my disposal. Thus I am enabled to present statistics of 110 eyes, all of which were enucleated on account of the stated affection. They are collected in the tabular statement at the end of this paper.

The eyes, furnished by Dr. Mooren, were given me by Dr. H. Knapp; the others I owe to the kindness of Drs. H. Knapp, E. Gruening, and T. R. Pooley, of New York, and to Drs. E. Williams and Ayres, of Cincinnati. To all these gentlemen I express my warmest thanks.

ANATOMICAL DESCRIPTION.

I.

Globes Enucleated on Account of Sympathetic Irritation.

1.

The following globe was enucleated by Dr. H. Knapp. The *Clinical Journal* presents the following notes:

Patient, Fr. Br., æt. 22. Six weeks previous to admission left eye was injured by a steel splinter. Since that time he has suffered intense pain in the injured organ, in which the right now participates. Furthermore, the right eye presents photophobia and excessive lachrymation. The left eye, at the lower ciliary region, has a scleral cicatrix and severe

ciliary neuralgia, chemosis, and iritis. The pupil shows a yellow reflex: on the floor of the anterior chamber is found a spongy, lens-like exudation. The enucleation was made upon the day of admission, followed by a rapid cessation of all the symptoms in the right eye.

The globe is of normal size. The section shows that the sclerotic, at the site of the lesion, is thickened, and that the choroid, retina, and a large ciliary nerve, are involved in the cicatrix. From the cicatrix a new-formed tissue passes into the vitreous chamber, which is filled by exudations. A neoplasm projects from the entrance of the optic nerve into the exudation in the vitreous space. The retina and choroid are attached to the sclerotic. The lens is normal.

A microscopic examination of the corneal tissue shows it to be completely normal; its marginal vessels are very hyperæmic.

The lens-shaped spongy exudation, in the anterior chamber, consists of a closely reticulated network of extremely fine fibrillæ of fibrin. Its interspaces contain some serous fluid, with an occasional round cell.

The iris is thickened and filled with numerous round cells and a quantity of hemorrhagic spots. Its vessels are very tortuous and hyperæmic. Its uveal pigment is very much diffused, especially at the periphery. The "angle of the iris" is choked with round cells.

The ciliary body contains fewer round cells than the iris, but is saturated with a serous exudation. The ciliary muscle presents no alteration.

The only place where the choroid is filled with round cells is at the site of the cicatrix; but all of its vessels are hyperæmic.

The Zone of Zinn has a thick coating of round cells, and the lens is entirely normal.

The pigmented scar is covered by a conjunctival tissue. The scleral margins of the wound are loosened, and abound with pigmented and round cells; its fibres seem to participate actively in the process of cicatrization, inasmuch as they pass into the cicatrix without sharp demarcation. The contents of the wound consist of a strip of connective tissue, which traverses the sclerotic, choroid, and retina, and is lost in the vitreous chamber. It consists of spindle-shaped and round cells, and contains much pigment

and new vessels. The divided tissues are inserted into this strip, as follows:

At a short distance from the cicatrix, the retina is found to be thickened, infiltrated with round cells; then its normal structure is entirely lost, being converted into a mass of spindle-shaped cells. Thus reduced, it coalesces with the cicatrix. The uveal pigment of the ciliary body sends long processes among the spindle-shaped cells into that part of the retina which has been thus transformed; and the uveal tract participates in the same changes. Its pigment is scattered in the cicatrix. The ciliary nerve, before it reaches the cicatrix, presents no visible pathological alteration, while in the scar itself it cannot be followed. All the tissues which participate in the cicatrization (except the nerve) are saturated with the remnants of former hemorrhages.

The other ciliary nerves show no pathological change.

The periphery of the retina is loaded with round cells, which condition is perceivable, almost without interruption, unto the site of the optic nerve. Some of the vessels of the retina are dilated, while others are reduced in calibre; the walls of all of them, however, are remarkably thickened.

An extensive piece of tissue, composed of round and spindle-shaped cells (granuloma), proceeds from the entrance of the optic nerve into the vitreous body. It not only caps the papilla, but proceeds from it. The connective tissue of the optic nerve, as well as its vessels, pass into this granuloma, which will be described later on.

In all probability this granuloma is attributable to a direct traumatism of the optic nerve. No foreign body could however be found in the globe.

The optic nerve is atrophied; the lamina cribosa and the longitudinal trabeculæ of connective tissue are materially thickened. Its vessels are hyperæmic. A number of hemorrhagic spots and coagulas of fibrin are found in the exudation which fills the vitreous chamber.

Anatomical Diagnosis.—Vulnus scleræ, involving the choroid and retina in its cicatrix; iridichoroiditis and traumatic retinitis; granuloma optici.

2.

The following globe was enucleated by Dr. H. Knapp, because of sympathetic irritation of the right eye. The history of the case presents the following points of interest:

A. B., æt. 30, presented himself for the first time in February, 1876, complaining of pain in his blind left eye and also in the right, which was healthy. In the left eye there was a soft cataract, the cause of which could not be stated by the patient. The iris was somewhat discolored and tremulous. The corneal epithelium presented irregularities. T. 1. —A bluish-black elevation, somewhat larger than the head of a pin, was found upon the lower part of the sclerotic, at 3''' from the corneo-scleral margin, which caused a doubt as to whether it was produced by a staphyloma of the sclerotic *sui generis*, or by an intra-ocular tumor. An enucleation was proposed; but the patient refused to consent to it. On June 5th he returned, and sought relief for increasing intense pain in the left eye, participated in by the right, and consented to have a small piece of the bluish-black substance removed, for the purpose of arriving at a precise diagnosis. This exploration revealed the fact that the case was one of a beginning scleral-staphyloma. The wound closed without reaction. The puncture afforded much relief to the patient, who left the institution two days later; but in two days more he returned, with a severe inflammation of the left eye—intense pain, photophobia, and lachrymation in both, and requested an enucleation. The day following the operation, all symptoms in the right eye had disappeared.

The globe is of normal size. The site of the puncture is depressed and covered with conjunctiva. Upon section the nucleus of the lens fell out of the capsule, in which some soft matter remained. Ciliary body much attenuated. A considerable extravasation is between the sclerotic and choroid at the site of puncture, and the posterior part of the ciliary body is involved in the cicatrix. Diametrically opposite to this spot, there is a second small staphyloma, exactly at the entrance of one of the venæ verticosæ. The nerve is deeply cupped.

The cornea is normal in all its parts. Its margin and the neighboring conjunctiva are very hyperæmic.

The cicatrix of the puncture shows the following microscopic details: Some vitreus, filled with round cells and pigment, is found between the scleral margins of the lesion. The wound

itself is covered by conjunctiva, which is infiltrated with blood and pus. The scleral margins of the wound, which must have been much thinned previous to the puncture, have regained their normal thickness, owing to an immense immigration of round cells. Furthermore, fresh red blood corpuscles are found among its fibres. Anteriorly, that part of the ciliary body which had been wounded by the puncture is involved in the cicatrix. That part of the ciliary body, which lies posterior to the wound and the adjacent part of the choroid, are separated from the sclerotic by extravasated blood, and crowded inwards. The tissues around the wound are suffused by a large number of round cells, and also are hemorrhagically infarcted. These conditions are maintained anteriorly as far as the periphery of the iris. The other parts of the uveal tract are very hyperæmic; otherwise normal. The ciliary nerves are very thin; their fibres, however, manifest no histological change. The layer of nerve fibres of the retina, as well as the ganglionic layer, are almost completely atrophied. The connective tissue elements are considerably thickened. The different layers of the retina show the remains of some old and a number of new hemorrhages of various quantities. The optic nerve is crowded beyond the boundaries of the sclerotic. The lamina cribrosa, which appears thickened, extends beyond the outer surface of the sclerotic. The vessels of the optic nerve are distended with blood, and its perineurium internum is thickened at the expense of the nervous elements.

Anatomical Diagnosis.—Cataracta mollis; glaucoma; staphyloma; vulnus scleræ; panophthalmitis circumscripta; atrophia nervi optici.

3.

The following eye was enucleated by Dr. Pooley, because of sympathetic irritation, which manifested itself in intense photophobia, lachrymation, and pain:

P. B., æt. 45, presented himself, some eight days previous, to the enucleation, stating that a splinter of iron had been forced into his right eye three weeks previously. At the time he had lachrymation, intense photophobia, iritis, and cyclitis dolens. Field of vision incomplete in an upward and outward direction. A foreign body, being supposed to be in the globe, enucleation was proposed, to which he did not consent.

He returned, in a week, with most severe pain and an aggravation of the above symptoms in the other eye. It now was evident that in the meanwhile the right eye had lost all perception of light. The anterior chamber was half filled with pus. The patient consented to the enucleation, which was performed without further delay. After it, all disturbances in the left eye disappeared rapidly.

The globe is of normal shape. A little more than half of the anterior chamber is filled by a yellow gelatinous mass. A similar product lies upon the macula lutea. No cicatrix appears either upon cornea or sclerotic, nor can any foreign body be found within the globe. The vitreus is perfectly clear, and macroscopically presents nothing abnormal.

Microscopically, the cornea appears unchanged. The endothelium of Descemet's membrane is crowded into the anterior chamber at several spots. The conjunctiva around the cornea is very hyperæmic, papillated, and saturated with round cells. The yellowish mass in the anterior chamber consists of threads of fibrin, closely reticulated, and enclosing some round cells. They are attached to the epithelium of the anterior surface of the iris, and can be followed into its substance. The iris is very hyperæmic, somewhat thickened, and replete with round cells. Its uveal pigment is somewhat loosened. The innermost layers of the ciliary body also show a number of round cells. Its vessels are hyperæmic. In several places there are found considerable extravasations, which crowded the fibres of the ciliary body apart. The ciliary nerves are normal. That part of the choroid which is adjacent to the ciliary body has within its inner layers a number of round cells. Further back, the choroid is very hyperæmic, and its vessels around the optic disc are much ectatic. Retina histologically unchanged. The exudation lying upon the macula, like that in the anterior chamber, consists of fibrin and round cells. In the vicinity of the macula, the threads of fibrin are firmly interwoven with the nerve fibres. The lens is perfectly normal. A microscopic search for a cicatrix or foreign body proves unavailing, showing conclusively that this is a case of contusion of the globe.

Anatomical Diagnosis.—Contusio bulbi; iritis purulenta; cyclitis, with hemorrhages; plastic choroiditis.

4.

The following eye was enucleated by Dr. E. Gruening:

Cl. G., æt. 67, had presented herself at the Clinic, two months previously, with severe neuralgia in her blind right eye, extending to her head and the left eye. She asserted that vision in her right eye had been lost fifty years ago, by a cold. The lens was cataractous, chalky, and dislocated downwards, lying upon the ciliary body. This could be easily perceived, since the lower part of the iris was shrunken to a thin unpigmented strip. Palpation revealed some hard spots upon the sclerotic, in all probability ossifications. The enucleation freed the left eye from irritation.

The ball is of a little more than medium size. A thickening of the insertion of the iris, at its scleral margin, somewhat reduces the depth of the anterior chamber. The iris is very thin. The anterior chamber is filled by a gelatinous exudation. The lens is calcified, and rests upon the ciliary body, behind the iris. The ciliary body is atrophied. A thin membrane, proceeding from the posterior part of the ciliary body, extends behind the lens. The space between it and the iris is filled by a gelatinous exudation. The ciliary body and the choroid are firmly attached to the sclerotic, which appears normal. The choroid is more or less thickened, and contains a number of bony formations. The retina cannot be recognized with the naked eye. The optic nerve is atrophied.

Microscopic examination yields the following:

The cornea is normal; at one part of its periphery the epithelium is somewhat thickened, but the tissues beneath are normal, thus excluding a perforation. Schlemm's canal is completely obliterated. The insertion of the iris is attached to the posterior surface of the cornea and stretched upon it, so as to represent a mere strip of atrophic membrane. Thence it curls inwards, regains its normal thickness, and is infiltrated with round cells. At this part of the iris the pigment of its stroma has been entirely destroyed, while that of the ciliary body and choroid has been partly destroyed. Near the papillary margin the iris is converted ino a thin tough strip of connective tissue, which has but few vessels and no pigment. Parts of the sphincter are preserved. The anterior surface of the iris is entirely covered

by a vitreous membrane, which, by low magnifying power, appears structureless; but higher powers show in it globular hyaline bodies, arranged like tiling, as are the cells of the epithelium upon the anterior surface of the normal iris. They seem to me a colloid metamorphosis of that epithelium. At other places, even under high power, there is a somewhat granulated hyaline continuous membrane discernible, probably resulting from a confluence of these colloid bodies. I cannot state what relationship this membrane may bear to those described by Donders and H. Müller as vitreous membranous new formations. The structures they described had no cellular elements, but were purely hyaline. The whole ciliary body is greatly atrophied, most so at the place where it was pressed upon by the dislocated lens. The vessels of the iris are scant, and their muscles are reduced to a few thin fibres, enclosing a partly serous, partly sero-purulent fluid. The fibres of the choroid, in the vicinity of the ciliary body, are crowded apart by the same kind of fluid. The stroma of the choroid is converted into coarse connective tissue, in which only the peculiar arrangement of blood-vessels and pigment recalls its former structure. The apparent thickening of the choroid, when seen with the naked eye, results from the addition of connective tissue, little bony plates, and remnants of the retina. The choroid itself is atrophic. The ossification is but incipient and peculiarly interesting in regard to its origin. The osseous plates never lie within the choroidal tissue, but *upon* it. The lamina vitrea is visible in all these sections which I made through the ossified parts, and is always situated *beneath* the bone. Furthermore, the peripheral parts contain numerous colloid excrescences, which are infiltrated with phosphate of lime. More posteriorly they assume that characteristic greenish-yellow tint, which is communicated to osseous tissue by Müller's fluid; but they still retain their form. Others, however, contain bone corpuscles. At the periphery of the choroid there are larger plates with bone corpuscles, Haversian canals, and blood-vessels. This coincides with the conditions formerly described by Arnold Pagenstecher, and myself. Besides this, the neighboring retinal tissue contains osseous granules, which are surrounded with pigment, and have to be regarded as colloid excrescences of the choroid, metamorphosed, as I have previously described. (See

Contributions to the Path. Anat. of the Eye.) At other parts the retinal tissue has degenerated into connective tissue, with occasional extensive pigmentation. The pigmented epithelium is absent in some places, but considerably augmented in others. The membrane extending from the back of the lens through the globe is to be considered as a cyclitic product, and is formed mainly by the retinal layer of the ciliary body and the fibres of the Zone of Zinn.

A small part of the lens has undergone fatty metamorphosis, presenting no cellular formations, while its larger part consists of amorphous chalk, firmly attached to the capsule. The centre of the lens is occupied by a small nucleus of sclerosed lens fibres.

Notwithstanding these extensive changes in the globe, the ciliary nerves present no histological alteration; which fact is so much the more interesting and worthy of notice, as the total supra-choroidal space was found obliterated. The optic nerve, as far as removed, is converted into connective tissue, the contraction of which reduced the scleral foramen to a minimum.

The exudation which fills the cavities of the globe is of a seropurulent nature.

Anatomical Diagnosis.—Irido-choroiditis plastica chronica, with complete atrophy of the iris, partial atrophy of the ciliary body and ossification of colloid excrescences of the choroid; detachment of the retina; atrophy of retina and optic nerve; cataracta calcarea.

5.

The following eye was enucleated by Dr. Pooley, it having been injured by a piece of steel four weeks previously. There was sympathetic irritation of the other eye, manifesting itself by pain and photophobia at the time of enucleation.

Globe of normal size. A cicatrix passes from the corneo-scleral juncture, meridionally backwards through the ciliary region. A section reveals the ciliary body to be attached to the cicatrix. The retina is detached, and all the cavities in the eye are filled by a hemorrhagic exudation.

The cornea presents no microscopic abnormities, except in the

region of the cicatrix. The iris is thickened. Its tissue is filled by round cells; many of its pigment cells are destroyed, and its vessels are hyperæmic. In the pupillary space, at the posterior surface of the iris and upon the ciliary body a fibrinous substance, saturated with blood, is found, uniting the normal lens to the iris.

The ciliary body is hyperæmic and infiltrated with pus, which presses its fibres apart. The retinal part of the ciliary body proliferates inwards, and draws the uveal pigment with it. Thence a fine fibrous network, enclosing fresh blood, passes diagonally through the globe and behind the lens. Posteriorly the network sends fibres to the inner surface of the retina, which is detached.

The retina shows no pathological modifications. The choroid is darkly pigmented, its vessels well filled, and its fibres separated by a small quantity of serous exudation.

The conditions of the cicatrix are as follows: The cornea and sclerotic, at the site of the lesion, are thickened. Their lamellæ enclose round cells and pigment. The cicatrix is covered by conjunctival epithelium, which penetrates rather deeply into the wound. The wound contains the periphery of the iris and the ciliary body. Both have lost their normal structure, and appear as a tissue, consisting of round cells and much free pigment, while their most external layers present a few spindle-shaped cells. The vessels of the prolapse are very hyperæmic. The ciliary muscular fibres have completely degenerated here. The tissues surrounding the lesion are filled with round cells.

The ciliary nerves are normal. The exudation occupying the anterior chamber is serous and filled with round cells.

Anatomical Diagnosis.—Vulnus corneo-sclerale, the cicatrix of which involves the iris and ciliary body; iritis purulenta; cyclitis plastica et serosa; choroiditis serosa.

6.

The following globe was enucleated by Dr. Knapp, because of suspected glioma retinæ. The notes of this case state briefly that the patient, a child, had suffered with some febrile disease, complicated with an affection of the eye, for a long time. It was brought to Knapp's Clinic, in Heidelberg, on the 24th of September, 1867; the diseased eye was found to be completely blind, staphylomatous in its anterior portions, while a yellowish

mass projected into the anterior chamber. A perforation of the cornea and sclerotic seemed imminent at several places. The other eye manifested a deep circum-corneal injection and intense photophobia.

The section of the globe, subsequent to enucleation, demonstrated that the affection was a chronic suppurative cyclitis.

Though the globe is abnormally small, still the cornea is considerably enlarged. The anterior chamber is filled by a somewhat pigmented tissue, extending beyond the ciliary body into the hyaloid space, which also is filled with an exudation. The lens is wanting. The retina is detached from the optic disc and crowded forward.

The microscopic conditions are as follows: At several places the cornea is converted into cicatricial tissue. It is infiltrated with round cells, so much so in its posterior lamellæ as to leave the corneal tissue barely recognizable. The neighboring conjunctiva and sclerotic are also filled with round cells. The tissue, which completely fills the anterior chamber and extends into the hyaloid space, has destroyed the endothelium of Descemet's membrane and the iris, and consists of a partly hyaline and partly fibrillary matrix, which contains numerous round cells, remnants of the pigment of the iris, and many vessels, some of which are very large.

The ciliary body is also permeated by round cells, especially its innermost layers. Its muscular part is normal and its vessels hyperæmic. Its retinal portion has been substituted by the above-described tissue. The ciliary nerves evince no pathological modification.

The pigment cells of the choroid are very pale (as is usual in children). The chorio-capillary layer is replete with round cells; veins hyperæmic.

The exudation, which lies between the choroid and retina and fills the rest of the hyaloid space, consists to a great extent of round cells, many of which contain two or three nuclei. The rods and cones of the retina are converted into club-like structures, and the granular layers are blended. The ganglionic and nervous layers are completely atrophied, and their connective tissue is much thickened. Those peripheral parts of the retina which are yet attached to the choroid are pigmented, and the free pigment lies in all the layers of the retina in the form of large

patches. The optic nerve is atrophied and its connective tissue much thickened.

Anatomical Diagn.—Keratitis, and irido-choroiditis and hyalitis purulenta, detachment and atrophy of the retina; atrophy of the optic nerve.

7.

The following eye is from Dr. Knapp's collection.

The history of this case says: The patient, Chr. Sch., presented himself on the 2d of April, 1868, stating that a splinter of iron had been thrown into his right eye two weeks before. The following night he suffered severe pain, followed by fever, deliria, and a rapid diminution of sight.

Stat. præs. (2. IV. 68.)—Some tumefaction of the lids, slight chemosis, deep injection of the sclerotic. The upper and inner half of the ciliary region is very tender to pressure. Slight projection of the sclerotic; a little inward from the vertical meridian the cornea shows a diffuse opacity. The upper and inner quadrant of the cornea slightly bulging and infiltrated with yellowish-white pus. The anterior chamber is filled by a yellowish-white mass of rather definite boundaries. Iris dimly perceptible at the upper and outer part. The presence of a foreign body cannot be determined. Paracentesis cornea. The patient was treated at the Clinic until April 25th, and, when dismissed, still suffered pain in the right eye, and especially at night. Deep circum-corneal injection; cornea depressed; iris discolored. Occlusion of pupil.—T.

The patient returned on the 20th of May, 1868, with the right globe atrophied and violent sympathetic irritation of the left. The right globe was enucleated on the same day.

The flattening of the cornea, and a consequent diminution of the anterior chamber, have produced a commensurate reduction of the size of the globe. The cornea presents a small central and a large marginal cicatrix. Section shows the iris closely adherent to the cornea. Behind it there is a broad cyclitic membrane. The hyaloid fossa is filled with a gelatinous exudation, and a similar substance is situated between the retina and choroid. The posterior part of the sclerotic is thickened, and materially contracted about the optic nerve. The entrance of the optic nerve is much thickened.

The microscope reveals the following conditions: The central

scar on the cornea is somewhat elevated; its epithelium, however, is hardly thickened. The elevation is caused by layers of tissue, parallel to the lamellæ of the cornea, which are wedged into the latter. Spindle-shaped cells of the cicatricial tissue proceed from the apex of the wedge through the cornea. Bowman's layer is curved inwards. The marginal scar shows thickened epithelium, which sends processes into the deep curves of Bowman's layer. Below and occasionally above this layer a very vascular tissue, containing numerous round cells (pannus-tissue), is found. The cornea is converted into scleroid tissue, sparsely provided with cells, but containing many vessels. As the convexity of the cornea is reduced, Descemet's membrane is wavy and its endothelium converted into spindle-shaped cells at such parts where it touches the iris. At several places these membranes are separated by a serous exudation.

In the ciliary region a cicatrix penetrates through the sclerotic and conjunctiva, and terminates in the ciliary body. It consists of spindle-shaped, round, and pigmented cells.

The tissue of the iris is irregularly thickened and filled with round cells; its vessels are hyperæmic. The pupil is occluded by a new-formed membrane. The ciliary body is adherent to the iris and drawn forward, so that the inner half of its muscle lies before its insertion. The muscular bundles thus drawn asunder, leave spaces between one another, filled with a sero-purulent exudation. Behind the above-described cicatrix, the ciliary body is drawn inwards by a large cyclitic membrane, which passes transversely through the globe. It consists, to a great extent, of an extensive proliferation of the retinal portion of the ciliary body, is scant in blood-vessels and envelops the Zonula Zinii, capsule, and remnants of the lens. It contains a number of round cells, especially in the neighborhood of the capsule of the lens.

The lens has assumed the shape of a saddle-bag, the isthmus of which is formed by a juncture of the anterior and posterior capsule. The lens fibres are destroyed, and substituted by liquor Morgagni and large vacuolated cells. The folds of the anterior capsule contain a tissue composed of round and spindle-shaped cells, permeated by fine vessels. The layers of the choroid are separated by a sero-purulent exudation. Some of its vessels are

hyperæmic, and the capillaries are surrounded by round cells. The majority of the ciliary nerves are normal. Only one of them is compressed in two places by the exudation, and even these two places present no other pathological modification.

The entrance of the optic nerve is infiltrated by serum, which separates its elements. Its vessels are distended with blood The lymph-sheaths of the vessels are much dilated, and contain serum and lymph-cells. Hemorrhagic spots are found between the nerve fibres. The whole retina is œdematous. Many of the ganglion cells are converted into translucent vesicles, the result either of a colloid metamorphosis, or serous imbibition. The rods and cones are converted into granulated club-like corpuscles.

Anatomical Diagnosis.—Phthisis anterior; vulnus corneæ; vulnus scleræ; sero-purulent and plastic cyclitis; sero-purulent choroiditis; œdema of the optic nerve and of the detached retina, traumatic cataract.

8.

The following eye was enucleated by Dr. Mooren, and bore the clinical diagnosis: Phthisis bulbi traumatica; cyclitis; sympathetic irritation of the other eye.

The globe is somewhat smaller than normal, from flattening of the cornea. The iris adheres to the posterior surface of the thickened cornea by means of cicatricial tissue. The sclerotic is thickened around the entrance of the optic nerve. Macroscopical examination reveals no other pathological alteration.

The microscopic examination shows the following: The corneal epithelium, though everywhere else normal in structure, conically penetrates the underlying tissue in two places, near the corneo-scleral margin; at this part Bowman's layer is severed, and the lips of its wound are wavy. The parenchyma of the cornea, which is remarkably thickened, is converted to a great extent into an irregularly laminated connective tissue. At the site of the scar, two strings of cicatricial tissue permeate its entire thickness; they are vascularized, and contain a great deal of pigment. Descemet's membrane is corrugated and drawn into these cicatricial strings. Some tough connective tissue lies behind them, the

fibres of which are so regularly arranged as to resemble corneal tissue. To this tissue are attached fragments of the torn iris on one side and the whole iris on the other. The pupil is occluded by a membrane, which consists of spindle-shaped and round cells, and which is closely adherent to the before-mentioned membrane, and furthermore envelops the folded capsule and remnants of the lens. The tissue of the iris presents no other pathological change.

At the uninjured part of the iris the capsule of the lens is still connected with the ciliary body, by the Zonula Zinnii. On the other side the tissues surrounding the capsule are converted into a cyclitic membrane of the usual structure.

The remnants of the lens are partly granulated, partly decayed.

Rows of pigment pass from the ciliary body into the cyclitic membrane. A close investigation shows these masses to be entirely independent of the blood-vessels, though in their appearance they resemble them very much. They are simply proliferations of the pigmentary epithelium (cf. Schiess-Gemuseus).

The ciliary body is drawn forwards and inwards. Its tissue presents no modification. The retinal part of the ciliary body participates in the formation of the cyclitic membrane as usual. Also the peripheral parts of the retina participate in this formation, have lost all their cellular elements, and degenerated into connective tissue.

The ciliary nerves, the parenchyma of the choroid, and the pigmented epithelium are normal. The veins of the choroid are hyperæmic. The entrance of the optic nerve is somewhat thickened and traversed by many new vessels. Its connective tissue is increased and its nerve-fibres are atrophied. At some distance behind the lamina cribrosa the nerve-fibres are normal. The connective tissue of the retina is also thickened. Many of the ganglionic cells have undergone colloid degeneration, and the inner as well as the inter-granular layer contains spaces filled with colloid matter.

Anatomical Diagnosis.—Phthisis anterior e vulnere corneo-sclerale; synechia anterior totalis; irido-cyclitis plastica; hyperæmia choroideæ; detachment and atrophy of the retina; neuritis optici.

9.

The following eye was received from Dr. Mooren, and bore the clinical diagnosis: Ciliary body torn by a weaver's-shuttle; cyclitis; sympathetic irritation of the other eye.

The globe is materially reduced in size. The entrance of the optic nerve and surroundings have been cut off. The corneo-scleral juncture presents a broad cicatrix After section the following macroscopic appearances are revealed: At the site of the scar both the cornea and sclerotic are curved inwards. The lips of the wounds of both are separated by broad cicatricial tissue, in the formation of which the conjunctiva, iris, ciliary body, and retina seem to participate. This cicatricial tissue traverses the pupil from before backwards, and envelops the iris and ciliary body, and is joined to the retina, which is detached and crowded forwards. The contraction of this tough tissue caused a retraction of the corneo-scleral margin near it and a bulging of the remainder of the cornea.

The corneal epithelium and parenchyma present changes only in the neighborhood of the lesion, where the epithelium is of considerable thickness and several of its cells are in a process of colloid metamorphosis. The corneal lamella adjacent to the cicatrix are separated by spindle-shaped and round cells, which penetrate deeply into the corneal lamellæ, and are accompanied by small vessels. Descemet's membrane is curved outwards at the margin of the wound, and its endothelium appears normal.

The scleral lip of the wound shows the same changes. Spindle-shaped cells project from the cicatrix into the scleral lamellæ (which are curved inwards) and destroy them. The neighboring parts of the sclerotic contain many round cells and numerous vessels.

The contents of the wound, or rather the cicatricial tissue, consist pre-eminently of spindle-shaped cells, intermingled with round cells, considerable quantities of free pigment, and many vessels. The ciliary body and retina are drawn into it, and they participate in the process of cicatrization by proliferation of their cel elements and destruction of their proper structure. Furthermore, the cicatrix contains a part of the capsule of the lens and some lens substance.

That part of the ciliary body which borders on the cicatrix, aside of the distortion of its muscular fibres, exhibits but a sparse increase of round cells. Between its fibres lie many crystals of hæmatoidin.

The cicatricial tissue then proceeds inwards and towards that part of the ciliary body which lies opposite to the cicatrix. It surrounds the iris, which is recognizable only by its pigment. Behind it a mass of fibrin, as yet not organized, is attached to the cicatricial tissue, which contains many red blood-corpuscles and surrounds the convolution of the retina at this part.

That part of the ciliary body which lies opposite the scar manifests rather prominent modifications. It is drawn forwards, and its posterior parts are detached. Its retinal part extends into the scar, and many round cells and crystals of hæmatoidin are found between its muscular fibres. The ciliary nerves are normal. The choroid is hyperæmic. The retinal rods and cones are changed, such as Pagenstecher describes. The cell elements of the retina are less numerous than normal and very granular. The connective tissue elements are much increased. Occasionally free pigment is found in the retina.

Anatomical Diagnosis.—Phthisis bulbi; vulnus corneo-sclerale, the cicatrization of which involves the ciliary body, iris, and retina; plastic cyclitis; traumatic cataract; hyperæmia of the choroid; detachment of the ciliary body and retina; atrophy and pigmentation of the retina.

10.

The following eye was enucleated by Prof. Knapp, for sympathetic irritation of the other:

L. K., æt. 49, states that two years ago a piece of wood was thrown against and broke his spectacles, thus materially injuring the right eye, which remained in an inflammatory condition a long time thereafter. Lately this inflammation recurred, accompanied by severe pain. Simultaneously there was pain in the left eye, with flashes of light and loss of the power of accommodation, all of which symptoms disappeared after the enucleation of the right.

The globe is reduced in size by a diminution of the convexity of the cornea. The latter shows a scar which traverses it diamet-

rically from one margin to the other, passing almost through its centre. Iris and lens are united to each other. The entrance of the optic nerve is excavated, and the nerve very narrow. A gelatinous exudation is found between the retina and choroid and in the vitreous chamber. The lens appears cataractous in its periphery. The epithelial layer of the cornea is thickened, and dips into the corneal parenchyma at several places, especially in the centre, where the cornea is depressed. Bowman's layer is torn in some places and very wavy. From the epithelial cones minute cicatricial cords pass into the corneal parenchyma, one of which passes through its entire substance. Pannous tissue, such as drawn by Pagenstecher, consisting of round cells and vessels, lies between the cornea and its epithelium, at the corneal margin. Bowman's layer is lost in the corneal lamellæ. All the epithelial layers are thickened.

The cicatricial tissue permeating the cornea is darkly pigmented, and contains not only free pigment, but also pigment cells, evidently from the iris. The cicatricial tissue consists essentially of spindle-shaped cells, which pass through the cornea, not only antero-posteriorly, but also send fibres between the corneal lamellæ, thus separating them widely. The iris adheres to the posterior end of the cicatrix, and to Descemet's membrane by a thin layer of spindle-shaped cells (transformed endothelium). In some places, however, where the adhesion is incomplete, the endothelial cells are partly proliferating and partly in a state of colloid degeneration. Descemet's membrane is undulating. In the rest of the corneal parenchyma there is only a small amount of cells.

The tissue of the iris is converted into cicatricial tissue at the site of its attachment to the cornea; its other parts are much thickened and filled with round cells.

In the area of the pupil, the wavy Descemet's membrane is attached to the lens capsule (also wavy and thickened) by means of a layer of tissue composed of spindle-shaped cells. The anterior third of the lens fibres are replaced by spindle-shaped and round cells, and some small vessels, the origin of which cannot be traced.

The products of the metamorphosis of the epithelium of the lens, described as characteristic of phakitis, by Iwanoff and

Becker, are not discernible in this case, as might have been expected. The granulated tissue passes directly into the fibres of the nucleus of the lens, which are normal. The posterior part of the lens has undergone fatty degeneration, leaving no recognizable lens-structure.

The ciliary body is drawn forward. Its fibres are filled with round cells; its muscular structure seems unchanged.

The fibres of the Zonula Zinnii are thickened and covered with many round cells.

The ciliary nerves, as far as they can be followed, appear normal.

The veins of the choroid are hyperæmic. The capillary layer of the choroid contains small round cells. The pigment epithelium is irregular.

The optic disc is a little depressed and contains a great deal of connective tissue. The layer of nerve fibres of the retina is very thin, and its supporting fibres are enlarged. The vicinity of the macula lutea presents many cavities, considered as characteristic of œdema of the retina. They are principally in the inner and outer granular layers, occasionally in the inter-granular layer.

The optic nerve is atrophic, with thickened connective tissue.

Anatomical Diagnosis.—Phthisis anterior; vulnus corneæ, the cicatrization of which involves the retina; cataracta traumatica; iritis purulenta; cyclitis plastica; hyperæmia choroideæ; detachment and atrophy of the retina; œdema of the macula lutea; excavatio atrophica nervi optici.

II.

The following eye was given to Dr. Pooley by a physician of this city, who, some time previously, had made a Graefe's extraction on it. Recently sympathetic irritation of the other eye manifested itself by pain, loss of the power of accommodation and photophobia, in consequence of which an immediate enucleation of the eye first mentioned was made.

The globe is of normal size. The corneo-scleral cicatrix is retracted. Section reveals the following: The anterior chamber is very small. The pupil is drawn towards the scar, and the iris is involved in the cicatrix and surrounded by granulation tissue, to the internal surface of which the posterior capsule of

the lens is attached. The ciliary body and choroid are broader than normal. The retina and the posterior part of the choroid are detached by means of a gelatinous exudation. The retina is still attached to the optic nerve, which is very thin. All the cavities of the globe are filled with a serous exudation.

The microscope reveals the following: The epithelium and parenchyma of the cornea are changed only in the neighborhood of the cicatrix. The corneal and scleral lips of the wound are turned inwards, while those of Descemet's membrane are curved outwards. The corneal lip of the wound is filled with round cells and pigment. Its lamellæ are loosened and traversed by fine vessels. Bowman's layer is wavy. The epithelium is thickened. The scleral wound manifests the same changes as does the corneal, being, however, less infiltrated with round cells. The lips of the wound are separated by iris and granulation tissue, the outer surface of which is completely covered with several layers of epithelium, derived more of the conjunctiva than the cornea. The outer part of the granulation tissue consists mainly of round cells, the inner of spindle-shaped cells. It encloses clusters of epithelial cells and free pigment, and is traversed by vessels. That part of the iris which is enclosed in the wound has no pigment, and is filled with round cells. Its vessels are connected directly with those of the granulation tissue.

The conjunctiva around the scar, and the epi-scleral tissue are full of free pigment and round cells.

The insertion of the ciliary body in the part corresponding to the cicatrix is broad and crowded forwards. Its meshes are replete with round cells, in the production of which the ciliary muscle seems to participate. The ciliary body, at the beginning of its posterior third, is traversed diagonally by cicatricial tissue, which begins from the fibres of the sclerotic, pierces the ciliary body, and then covers its inner surface. The tissue consists of spindle-shaped cells, but contains many round cells; also pigment molecules and the residue of a hemorrhage. At the inner surface of the ciliary body it encloses the fibres of the Zonula Zinnii, and extends to the posterior capsule of the lens, which is stretched transversely through the eye.

A little behind the scar in the ciliary body another similar one is found in the choroid. Its fibres also come from the sclerotic,

are strongly pigmented, pass through the choroid, and form a nodule between the choroid and retina, the size of a pin-head, consisting of tough fibrous, darkly pigmented tissue. The neighboring choroid sends into it a few vessels, which have pigmented coats. The lamina vitrea is markedly undulating, and is broken by the fibrous tissue. These changes, in all probability, are the result of an abscess between the choroid and sclerotic, which involved the inner layers of the sclerotic and opened inwardly. This was materially assisted by the traction which the choroid had been subjected to by the cicatrization.

The choroid is filled with round cells, interspersed with much free pigment, and crowded to clusters in some places. The pigmented epithelium is degenerated.

The ciliary nerves are normal. The retina evinces a connective-tissue proliferation, at the expense of the cell elements of all its layers. The rods and cones have become converted into club-like bodies. The optic disc is œdematous, and the lamina cribrosa thickened. The remainder of the optic nerve appears normal. The exudation in the vitreous is full of round and spindle-shaped cells, and also contains the residues of hemorrhages.

Anatomical Diagnosis.—Incarceration of the iris and capsule of the lens, in the cicatrix, produced by the extraction of a cataract; panophthalmitis purulenta.

12.

The following eye was obtained from Prof. Knapp's collection, and bore the clinical diagnosis: Corneal cicatrix involving the iris. Enucleated for sympathetic irritation of the other.

The globe is remarkably lengthened. The cornea is somewhat flattened. Section shows the periphery of the iris firmly adherent to the corneal cicatrix. Towards the centre it forms a large serous cyst. The remainder of the iris is firmly attached to the cornea. A thin membrane extends from the ciliary body behind the lens, which is pushed forward. In one place the retina, which is partially detached, is united to this membrane. In the posterior part of the eye the changes known as sclero-choroiditis posterior are very pronounced. The optic nerve is deeply excavated.

Microscopical Examination.—The corneal epithelium sends a small conical prolongation into the canal of the scar. The cicatricial tissue which traverses the cornea is pigmented and vascularized. It extends to the anterior capsule (which is torn and folded), and touches the degenerated lens-substance. The lips of the wound of Descemet's membrane are enveloped by the new-formed tissue which forms one wall of the cyst, while the remainder is formed by the sphincter portion and Descemet's membrane. This latter part of the cyst-wall (Descemet's membrane) is covered by a thin layer of spindle-shaped cells. The remainder of the iris is firmly connected with Descemet's membrane, and is so atrophic as to represent a mere strip of pigment. Where the iris forms the wall of the cyst, it curves back with the cicatricial tissue, and inserts itself into the capsule of the lens. The sphincter iridis is preserved, but greatly stretched. The inner surface of the walls of the cyst is lined by the endothelium of the anterior chamber, which is changed, and forms several layers. At those places where the iris adheres to Descemet's membrane a number of endothelial cells are in process of retrogressive metamorphosis. The atrophic iris contains a few diminutive vessels.

Both capsules of the lens are folded, and the anterior is firmly united to the cicatrix. The fibres of the lens have degenerated into a fatty molecular substance, which contains numerous drops of liquor Morgagni.

The contents of the above-described cyst are mainly of a serous nature. Near its walls are small accumulations of large, round and oval, granular and opaque cells, with one or more nuclei, some of which are decaying. That membrane which passes from the ciliary body to the posterior surface of the lens is not a cyclitic new-formation, as it appears macroscopically, but the thickened Zonula Zinnii.

The ciliary nerves are normal.

The choroid, in some parts of its periphery, is completely atrophied and converted into connective tissue. At the same places its pigmented epithelium is destroyed. The vessels of the remaining choroid are very hyperæmic. In the vicinity of the optic nerve the number of pigment cells of the parenchyma of the choroid is reduced, and the pigment granules assume a lighter tint. In a similar manner the vessels lose their regu-

larity, and are separated by broad zones of fine unpigmented connective tissue. The pale pigment cells are found in discrete, irregular clusters. The capillary layer of the choroid has almost completely disappeared. The pigmented epithelium presents the same changes as the pigmented cells of the stroma of the choroid. Though the hexagonal shape of its cells is tolerably well preserved, their pigment becomes the more deficient the nearer they are situated to the optic disc.

The retina which lies over the atrophic patches of the choroid is likewise atrophic. The cellular elements, as well as the nervous fibres in these places, are destroyed, and replaced by very delicate and long connective-tissue fibres, which enclose a few round cells. The optic nerve is deeply excavated. The nervous fibres, here and in the adjacent parts of the retina, are destroyed. The pillars of connective tissue are hypertrophied. The remaining parts of the retina appear normal.

Anatomical Diagnosis.—Sclero-choroiditis posterior; vulnus corneæ, with incarceration of the iris; serous cyst; cataracta traumatica; choroiditis disseminata, atrophica; glaucomatous excavation; atrophy of the retina and of the optic nerve.

13.

The following eye was contributed by Dr. Mooren, and bore the clinical diagnosis: Corneal wound with prolapse of iris; eye enucleated for sympathetic irritation of the other.

The globe is of normal size. Section shows the iris connected with the two ends of a corneal scar. All the cavities of the eye are filled with hemorrhagic exudation. The entrance of the optic nerve is cupped.

The microscope reveals the following conditions: The corneal epithelium is thickened in all of its layers. At both ends of the scar, near the corneal margin, Bowman's layer is absent, and the epithelium sends conical prolongations into the substance of the cornea. A markedly vascularized pseudo-membrane, composed mainly of spindle-shaped cells, is situated between the epithelium and parenchyma. The corneal parenchyma is sclerosed, and its outer-layers only are sparsely vascularized. Descemet's membrane is covered by blood, and its endothelium is undiscernible. Near the scar the broken Descemetii curls inward.

The iris is connected with the cornea by a fibrous, irregularly laminated tissue, and itself is converted into coarse fibres of connective tissue, interspersed with round cells and free pigment. The pupil is obliterated. No trace of the sphincter is perceptible. The "angle of the iris" is infiltrated with blood.

The inner layers of the ciliary body contain a great number of round cells. Its uveal pigment is degenerated, and its retinal part proliferating. The walls of its hyperæmic vessels are thickened. The muscular fibres are separated by serous exudation. The ciliary nerves are unchanged.

The tissue of the choroid contains numerous round cells and hemorrhagic infiltrations. Its vessels, especially the veins, are dilated. The pigment of its parenchyma is pale, but the cells well preserved. The pigmented epithelial cells have lost their regular outlines. Some of them are entirely pale, while others are but partially filled with pigment. At many places colloid excrescences lie upon the lamina vitrea. Most of them contain deposits of amorphous lime. The colloid excrescences are unusually large, and accumulated in such a manner as to resemble the ophthalmoscopic picture of disseminate choroiditis.

The entrance of the optic nerve is cupped. The deepest part of the excavation projects beyond the region of the scleral ring. The fibre-bundles of the lamina cribrosa are thickened and separated by empty cavities. The nervous elements seem to have been completely destroyed here, while behind the lamina cribrosa they resume their normal appearance. The connective-tissue elements of the optic nerve are multiplied. In the parts of the retina surrounding the excavation much areolar connective tissue is found. The layer of nervous fibres of the retina is atrophied and œdematous. Otherwise the retina is normal. At some places, between the retina and choroid, serous exudations and hemorrhages are found.

Anatomical Diagnosis.—Vulnus corneæ with attachment of the iris; atrophy of the iris following plastic iritis; cyclitis; chronic choroiditis with hemorrhages; colloid excrescences of the choroid, with deposits of lime; glaucomatous excavation; atrophy of the optic nerve and retina.

14.

The following eye was enucleated by *Dr. Knapp*, at Heidel-

berg, in 1868. The clinical diagnosis says: Hæmophthalmus; enucleation for sympathetic irritation of the other eye.

The globe is of normal medium size; aqueous and vitreous chambers completely filled with blood. The pupil is dilated to the utmost. The lens is dislocated backward. The retina is detached and pushed forward.

Microscopic investigation shows: The thickness of the cornea is reduced. The epithelium of the corneal margin is considerably thickened, and penetrates into the subjacent tissue, like papillæ. The adjacent conjunctiva presents papillary proliferations, and its congested vessels project abnormally over the corneal margin. A small part of the periphery of the iris is attached to the corneo-scleral tissue. At the same place Descemet's membrane is detached by a slight hemorrhage.

A tough connective tissue surrounds the iris and ciliary body, which is saturated with pigment, and contains a great number of new-formed vessels. A cyclitic membrane extends from the ciliary body transversely through the eye. The detached and atrophic retina adheres firmly to this membrane.

The choroid is thickened, in consequence of a serous exudation, into Haller's layer. The vessels are here replaced by strings of connective tissue, and the pigment cells of the parenchyma are atrophic. The capillary layer is darkly pigmented and hyperæmic.

Anatomical Diagnosis.—Contusio bulbi; hæmophthalmus; luxatio lentis; cyclitis plastica, with hemorrhages; choroiditis serosa; retina detached, and atrophic.

15.

The following eye was enucleated by *Dr. Knapp:* It suffered from acute suppurative iritis, and was removed for sympathetic irritation of the other. In the enucleated globe a foreign body had lodged for twelve years. I described this eye in my contributions to the Pathological Anatomy of the Eye (to appear in the next volume), and shall mention only what is essential for our present purpose.

A splinter of coal lay in the posterior part of the ciliary body and the adjacent sclerotic. It was encapsulated by connective tissue.

In consequence of chronic traumatic inflammation, the retina and choroid are atrophied. Acute purulent inflammation of the entire uveal tract had recently set in. The capsule of the lens was injured; the lens-substance not yet entirely absorbed. The optic nerve was atrophic. The ciliary nerves were entirely normal.

Anatomical Diagnosis.—Corpus alienum in corp. cil. and sclera; old traumatic chorioretinitis, with atrophy; fresh irido-choroiditis suppurativa; atrophy of the optic nerve.

The following forty-two cases of eyes enucleated for sympathetic irritation, recorded in literature, deserve here to be mentioned.

From Graefe's Archiv.

Volume. IV., 1. pp. 363. *Heinrich Müller.*—The enucleated globe shows sclerectasia with irido-choroiditis. The retina is detached. Cataracta capsularis. Ciliary nerves atrophic.

IV. 2, pp. 9. *Iwanoff.*—The globe had suffered a contusion in the region of the ciliary body. There was diffuse suppurative choroiditis.

Ibid.—The globe suffered a severe contusion. There was hæmophthalmus. The connective tissue of the choroid is considerably hypertrophied. The neuroglia of the ciliary nerves is thickened. The nerves contain occasional round cells.

Ibid.—In this eye reclination of a cataractous lens had been performed. The lens lies upon the ciliary processes, and is attached to the iris by new-formed connective tissue. This tissue separates the ciliary body and neighboring parts of the choroid from the sclerotic.

Ibid.—A cataract had been extracted from this eye. Sero-purulent irido-choroiditis. Vitreous turbid.

XX. 1, pp. 97, *Brecht.*—Cicatrix at corneo-scleral margin. Irido-cyclitic membranes have detached the choroid and retina.

Ophthalmic Hospital Report.

IV. 4, pp. 369. *Lawson, Geo.* CASE V.—The eye had been injured eight days previous to the time when sympathetic manifes-

tations necessitated an enucleation. Irido-dialysis and dislocation of the lens into the vitreus are found. Retina and choroid had been detached by hemorrhages.

Ibid. CASE VIII.--Sympathetic irritation appeared three years subsequent to the injury. A scar is found in the ciliary region of the sclerotic. Ciliary body and choroid are in the cicatrix. A foreign body is embedded in the ciliary body. Suppurative cyclitis. Retina detached.

VI. pp. 284, *Vernon, J. B.*—1. Wound in the ciliary body. Sympathetic irritation twenty-five years later. The cicatrix traverses the sclerotic and ciliary body. Thence a dense tissue proceeds inward. Several ciliary nerves project into the cicatrix. Lens absent. Vitreus reduced to a thread of connective tissue. The retina is detached by an exudation, which contains blood and cholesterin.

2. A foreign body, which had passed through the eye, lies behind it upon the optic nerve, and produces severe sympathetic irritation. An iridectomy and cataract extraction had been performed, to reduce the sympathetic irritation upon the other eye. A short amelioration was followed in two weeks by renewed and increased irritation. Then the injured globe was removed. The cicatricial tissue proceeds from the cornea through the iris and vitreus, to be inserted into the optic nerve, surrounding which little nemorrhages are found between the retina and choroid. The globe contains no foreign body, but a piece of a gun-cap is found firmly attached to the optic nerve by new-formed connective tissue.

3. Gunshot wound in the ciliary region. Sympathetic irritation of the other eye. The enucleation was made four weeks subsequent to the injury. The iris is so involved in the cicatrix as to cause the appearance of an iridectomy. The retina is detached at the wound and around the entrance of the optic nerve. The first scar is apparently that produced by the entrance of the foreign body. Not far distant is another scleral cicatrix (exit?). Both are connected by new-formed tissue.

4. Wound in the ciliary region. Sympathetic irritation of the other eye. The globe was enucleated three months subsequent to the injury. The cornea shows a somewhat indrawn marginal scar, and is dim. The retina is totally detached; also dimmed

and shrunken. Between it and the choroid lies a yellow exudation.

5. Wound in the ciliary region. Rapid sympathetic irritation of the other eye. Enucleation was performed eight days subsequent to the injury. Vitreus and lens have partly escaped. A lacerated wound traverses the entire anterior half of the globe. Fresh hemorrhages lie between the retina and choroid.

6. Puncture from above through the ciliary region. Sympathetic irritation of the other eye. Enucleation five weeks subsequent to the injury. The wound proceeds from the scleral margin, through the cornea, to beyond the pupil. Both angles of the wound contain iris. Opposite a scleral scar involves choroid and retina. Retina and choroid are separated by discolored blood. The lens is absent.

VIII. *Brayley, W. A.*, pp. 561.—The eye was removed seventeen days subsequent to the injury. Sympathetic irritation had existed for ten days. At the outer corneal border a cicatrix, which involves the iris, is found. Lens cataractous. A little piece of iron, covered by new-formed tissue, lies upon the ciliary body. Retina œdematous.

Observations from the Ophthalmic Institute at Wiesbaden, 1862.

Enucleatio bulbi and sympathetic ophthalmia, by Hofr. Pagenstecher, M.D. Autopsies by *Dr. Arnold Pagenstecher.*

Pp. 51–2. (*Autopsy I.*)—Seven or eight years previous to the enucleation, a little stone had been thrown into the patient's eye. Investigation shows chronic irido-choroiditis purulenta. The lens has been absorbed. Retina detached. The stone is attached to the sclerotic by a new-formed tissue.

5. (*Autopsy III.*)—Six years previous to the enucleation the patient was butted in the eye by a cow. The eye is phthisical. The corneal scar involves the iris. Retina detached. The choroid presents many colloid excrescences, which ossify posteriorly, and further on become transformed into a large bony plate.

6. (*Autopsy IV.*)—Twenty-nine years previous to the enucleation, the patient had a perforating corneal ulcer, which was followed by a chronic irido-choroiditis and calcareous cataract. A fresh keratitis produced so severe a sympathetic irritation of the other eye as to necessitate enucleation. The globe is small. The

cornea presents an ulcer. Iris atrophied. The choroid is ossified at the equator, and completely atrophied at the periphery. Retina detached.

9. Nine weeks previous to the enucleation the eye was injured by a fragment of a percussion-cap. The cornea presents a large cicatrix. There is complete anterior synechia. Lens shrunken. Retina detached. The foreign body lies in the vitreus, surrounded by pus.

12. (*Autopsy XI.*)—Globe atrophic. Grains of powder are found in the ciliary body. Irido-choroiditis (purulenta ?) and a cyclitic membrane are found. The vessels and nerves of the ciliary body manifest no change. The vitreous is purulent.

Annual Report of the Ophthalmic Hospital at Utrecht, 1865.

Page 84. *Maats, J. J.*—1. The eye was lost twenty years previous to the enucleation, in consequence of variola, and has been painful for three years past. The retina is detached and adherent to an irido-cyclitic membrane, and pigmented in spots, especially about its vessels. Points in the choroid, corresponding thereto, are deprived of pigment. The optic nerve is excavated.

2. The eye was destroyed three years before the enucleation. A large quantity of chalk is found in place of the iris and lens. The posterior part of the globe is normal.

4. Sympathetic irritation was produced by an eye which had previously been destroyed by glaucoma, notwithstanding an iridectomy which had been made. Subsequent to its removal, kerato-iritis was found. The iris is atrophied to a great extent, while the ciliary body and retina are completely atrophied.

5. The modifications in this globe were produced by recurrent syphilitic iritis. The iris is atrophied, and behind it some remains of the lens are found. The sclerotic is staphylomatous. The retina and choroid are firmly adherent thereto and atrophied. The retina is entirely detached, and the choroid is attached to it, except around the papilla, where it (the choroid) is detached.

6. Three weeks previous to the enucleation, the cornea had suffered a perforating wound with prolapse of the iris. The iris is firmly adherent to the cornea. The lens is cataractous. A splinter of iron lies upon the choroid. The vitreous and ciliary

body are in a state of suppurative inflammation, and the retina is detached from the entrance of the optic nerve.

8. The disease of the eye lasted twelve years previous to the enucleation, and it has been blind for nine years. It had been subjected to iridectomy and extraction of cataract. Thereupon irritation in the other eye supervened, which was iridectomized because of increased tension. The iris is adherent to the corneal margin. The retina is detached, and lies against the iris, enclosing four large chalky concrements, which rest upon the ciliary body. The choroid is much shrunken, and its periphery is also calcified. A cyclitic membrane is found.

16. The eye had been injured six weeks previous to enucleation. The anterior chamber is filled with pus. Purulent cyclitic masses are united with the capsule of the lens. The retina is detached and atrophic. The vitreus is filled with pus, which enclosed two fragments of copper.

Sympathische Gesichtsstörungen. (Sympathetic Affections of the Eye.) *By Dr. Mooren*, 1869.

Page 129, *Schiess-Gemuseus.*—An artificial eye was wòrn upon the blind globe, for two years previous to the enucleation. Sympathetic irritation was combined with epileptic attacks. A ciliary membrane encloses the fragment of a percussion-cap. The outer layers of the ciliary body are closely adherent to the sclerotic. The lens is shrunken, and encircled by the detached retina. The choroid is ossified around the optic nerve. The neurilemma of the ciliary nerves contains chalky concrements.

Iwanoff, ibid., p. 161.

To p. 38.—The globe was destroyed in consequence of iridochoroiditis gummosa. It is atrophic. The iris is attached to the ciliary processes and anterior surface of the cataractous lens, by a new-formed tissue, and its papillary margin is swollen. The ciliary body is much thickened. Its meshes are filled with round cells, the muscular portion participating actively in their formation. It also has a number of new vessels. The neighboring parts of the choroid are infiltrated with cells; the remainder is hyperæmic. The retina is œdematous, with proliferation of its connective-tissue elements. The structure of the iris is destroyed, its tissue having been converted into a mass of round

cells. Schwann's sheath of the ciliary nerves is thickened, and its nuclei are swollen.

Ibid. to p. 46.—An abscess of the cornea, with prolapse of the iris, occurred seventeen years previous to the enucleation. There is phthisis anterior. The iris is involved in the corneal cicatrix, and in its entire extent is attached to the cornea, which is converted into cicatricial tissue. The ciliary body is much thickened, and so drawn inwards by a cyclitic membrane that its posterior part and the neighboring choroid are detached. The lens is much shrunken, and attached to the iris and cornea. The retina is atrophic, with a partial obliteration of its vessels. The choroid presents colloid excrescences. Aside of these results of old inflammations, a new inflammatory process has set in. The periphery of the iris, as well as the ciliary body, the vitreus and the sclerotic about the plexus venosus are filled with round cells strongly vascularized. The connective tissue of the ciliary body is hypertrophied, and the course of its muscular fibres changed. The retraction of the cyclitic membrane caused its detachment from such places where the ciliary body is attached to the retina, thus forming cavities between the pars ciliaris retinæ and ciliary body, filled with an exudation pressing upon the ciliary body (!). Round cells fill the periphery of the retina.

Page 104.—The eye became phthisical, in consequence of the extraction of a cataract. Notwithstanding this clinical statement, the volume of the ball seems increased. The cicatrix of the wound caused by the extraction contains some iris and remnants of the capsule. The cicatricial tissue is attached to a cyclitic membrane, which, in its retraction, has drawn all the membranes towards the scar, and has caused a detachment of the opposite part of the ciliary body from the sclerotic. The vitreus is filled with an exudation.

Provincial Medical and Surgical Journal.

1851, p. 66, *Prichard, Aug.*—The eye was enucleated thirteen years ago, subsequent to the injury. The lens is absorbed, and the capsule presses (!) upon the ciliary body. The choroid is separated from the sclerotic by a thick, firm mass of fibrin, which is pierced by a ciliary artery and a stretched ciliary nerve; otherwise it appears healthy. The retina is healthy. No foreign body can be found in the globe.

Annales d'Occulistique.

1860, p. 150. *Case of Dixon;* examined by *Bader.*—Five years previous to the enucleation the eye had been injured and its vision destroyed. The anterior chamber is filled with blood and yellow fluid. The vessels of the iris are "varicose." The posterior surface of the iris is completely attached to the (cataractous) lens. The retina is detached.

Archives of Ophthalmology and Otology.

II., 1, pp. 16, *Knapp, Herman.*—The eye was enucleated five years subsequent to an injury of the cornea, iris, lens, and the ciliary body. Plastic iritis and cyclitis are found. The retina is detached. The choroid is ossified.

Archiv für Heilkunde.

1871, p. 226, *Peppmüller, Felix.*—The globe was examined by *Leber,* after it had been enucleated by *Alfred Graefe.* At the time of the operation, vision was almost normal. The ciliary body is normal, though a piece of a percussion-cap lies upon it. The pars ciliaris retinæ is thickened, and a small part of the neighboring vitreus is purulent. There is connective-tissue proliferation around the entrance of the optic nerve.

Schussverletzungen des Auges. (Gunshot Wounds of the Eye.)
By Cohn, Herm.

CASE 28, p. 25, *Waldeyer.*—The eye was enucleated about six months subsequent to an injury of the zygomatic process, etc. The following conditions presented themselves: Chronic chorio-retinitis, with atrophy of the choroid and a plastic exudation upon the retina undergoing fibrous degeneration.

CASE 31, p. 30.—The enucleation was performed six months after the injury. *Waldeyer's* examination of the globe showed no pathological change, except one hemorrhage and the formation of folds in the macula lutea.

Injuries of the Eye, Orbit and Eyelids.
By George Lawson.

Page 214, CASE XLIV.—A scar in the ciliary region of the sclerotic unites with it the ciliary body and choroid. A metallic splinter, surrounded by pus, rests upon the ciliary body. The lens is cataractous, the retina detached.

Ibid., CASE LXI.—The ciliary region of the sclera presents a large cicatrix. The lens and iris are absent. The vitreus is filled with blood; extensive hemorrhages are found between the retina and choroid, and between the choroid and the sclerotic.

Ibid., with fig. 67.—The globe had been injured thirty years previous to the enucleation. The choroid is ossified around the entrance of the optic nerve. The retina is detached.

Ibid., CASE LXXIV.—The eye was destroyed, apparently by blennorrhœa, sixty years previous to the enucleation. The cornea is converted into cicatricial tissue, and infiltrated with chalk. Almost the entire choroid is ossified. The retina is detached in the common funnel-shaped condition.

II.

EYES ENUCLEATED FOR SYMPATHETIC IRITIS.

16.

The following globe was enucleated by *Dr. Pooley*, for sympathetic iritis, which had supervened in the other eye.

The globe is reduced in size, from flattening of the cornea. The sclerotic is depressed towards the axis of the globe in several places. Transverse section shows the iris attached to the cornea; the lens cataractous in its periphery; posterior part surrounded by a cyclitic membrane, to which folds of the completely detached retina are united. The choroid is much thickened, especially at the points where the sclerotic is depressed, and firmly adherent to the sclerotic. The optic nerve is very thin. All the cavities of the globe are filled with a purulent exudation.

The microscope shows the cornea to be converted into dense cicatricial tissue, and covered by conjunctiva filled with round cells. Descemet's membrane is undulating, and its endothelium at several places is transformed into spindle-shaped cells.

The peripheral part of the anterior chamber is preserved, but shallow in the centre. The iris adheres to Descemet's membrane by layers of spindle-shaped cells.

The iris is saturated with round cells, and shows but few vessels. Its uveal pigment is distributed irregularly. The posterior surface of the free part of the iris, attached to Descemet's mem-

brane, the ciliary body, and the posterior capsule, are covered by an accumulation of round cells, into which the retinal part of the ciliary body has proliferated.

The ciliary body is converted into a fibrous tissue, which presents many cavities filled with an exudation, few remnants of its muscular tissue, and very few vessels.

The choroid is changed into a tissue of very fine fibres, which has only a small number of vessels, and is filled with free pigment. The pigmented epithelium is well preserved everywhere. The choroid, around the entrance of the optic nerve, is completely atrophied. The pigmented epithelium is found to be separated from the sclerotic only by a minute layer of fibres.

The ciliary nerves cannot be found. They seem to be entirely destroyed.

The retina, which is detached, and has undergone connective-tissue degeneration, presents mere traces of the granular layers. It is pigmented in spots, without any typical arrangement.

The connective tissue of the optic nerve is considerably thickened. Its nervous fibres, much reduced in number, are occasionally dimmed by fat.

Anatomical Diagnosis.—Phthisis bulbi; vulnus corneæ; synechia anterior; iritis purulenta; cyclitis serosa et plastica; choroiditis chronica hypertrophica; atrophy of the detached retina and the optic nerve.

17.

The following eye was enucleated by *Dr. Pooley* for iritis serosa sympathetica of the other. The size of the globe is reduced from flattening of the cornea. The entire cornea is covered by conjunctiva. The iris is firmly attached to the posterior surface of the cornea, and its posterior surface is covered by a cyclitic membrane with which the peripheral part of the retina is connected. The retina is detached in the shape of a funnel. The ciliary region seems to contain some osseous tissue. The ciliary body is atrophic. The sheath of the optic nerve is thickened.

Microscopic examination reveals the following: The cornea, barely recognizable as such, is covered by a thick conjunctival layer, which is strongly vascularized and covered with papillary elevations. The corneal epithelium and Bowman's layer are destroyed. The corneal tissue is converted into connective tissue,

without any lammellation, which contains vessels and much free pigment. Descemet's membrane is wavy. A mass of new-formed tissue lies on its posterior surface, which is barely distinguishable from that of the cornea. Some clusters of iris pigment are the only remains of that membrane. Immediately behind, the retina is found attached to the new-formed tissue.

The ciliary body is reduced to a microscopic layer of muscular tissue. Its uveal pigment is drawn into the surrounding new-formed tissue. Upon and within this lies the periphery of the retina, which is bent forward and pigmented.

The new-formed membrane and the retina contain many osseous islets, which are mostly grouped about vessels and surrounded by pigment.

This strange location of osseous deposit in the retina I had never seen before. The condition finds its explanation in the presence of colloid excrescences in the choroid, afterward to be described. It is found in eyes which present colloid excrescences upon the choroid, that when the retina is detached from the choroid, a number of the excrescences adhere to it. Furthermore a number of cases have been described wherein these colloid excrescences were the starting-points for ossification. According to *Knapp's* theory, one should assume that the retina had been saturated by a choroidal exudation, which afterwards became converted into bone.

Otherwise the retina is completely degenerated into connective tissue, and contains much free pigment, hæmatoidin, and lime-phosphates.

The choroid is very atrophic. Upon the lamina vitrea lie many colloid excrescences. The pigment epithelium is changed in such a manner that it perhaps might throw some light upon the formation of the colloid excrescences. Its cells have lost their regular shape. In a number of cells one or more round cavities are found, which crowd the granular pigment aside. These changed cells become confluent occasionally. Then a number of such cavities are surrounded by a thickly-pigmented ring, and separated from each other by minute streaks of pigment. The whole process is analogous to colloid metamorphosis. At such places where these changes are the most advanced, a greater or smaller number of colloid excrescences are found, sur-

rounded by pigment. It would thus appear as though the formation of colloid excrescences should be viewed as a metamorphosis of the pigment epithelium. Whether it be colloid matter, or what else, with which the cells are infiltrated, I cannot say (cf. Donders).

The pigmented parenchyma cells of the choroid are very pale, and have lost their sharp contours.

The ciliary nerves show no pathological change.

The optic nerve is atrophic.

Anatomical Diagnosis.—Phthisis anterior; vulnus corneæ; atrophy of the iris and ciliary body after plastic irido-cyclitis; detachment and ossification of the periphery of the retina; colloid (?) metamorphosis of the pigment epithelium; colloid excrescences upon the choroid; atrophy of the choroid, retina, and optic nerve.

18.

The following globe was enucleated by *Dr. Knapp*, in Heidelberg, for sympathetic iritis in the left eye. The record of this case states merely that C. M., æt. 18, could count fingers with the left eye, at four feet, previous to the enucleation (2, VII., 68) and was discharged three weeks later with a visual acuity of $\frac{20}{70}$.

The globe is smaller than usual. The cornea presents a marginal scar, around which it is flattened. Section shows the ciliary body, iris, and lens to be attached to the cicatrix. The opposite side in the meridional sections shows the posterior surface of the iris to be attached to the ciliary body. The remaining part of the anterior chamber is filled with a serous exudation. Posterior to the lens, a delicate cyclitic membrane passes diagonally through the globe. The whole retina is detached, except around the optic nerve and at its periphery. The optic nerve is attenuated, and the sclerotic is thickened around the optic nerve entrance.

The following conditions are discovered by the microscope: The epithelium around the cicatrix is thickened, and sends papillary prolongations into the tissue of the cornea. Bowman's layer is corrugated. The cicatricial cord is very broad, and contains many round cells. The neighboring corneal lamellæ are distorted and vascularized. Descemet's membrane is curved outwards into

the canal of the cicatrix. The cicatricial tissue is connected with the remains of the iris. The iris, the ciliary body, and the neighboring choroid are disorganized in the same manner, forming a continuous stratum of round cells, interspersed with remnants of pigment.

That opposite part of the iris is firmly united with the apices of the ciliary processes thinned. The adjacent iris is stretched, and contains numerous round cells.

The equatorial part of the capsule of the lens which lie near the corneal-scar is retracted and folded. It is covered by a layer of spindle-shaped round cells and vessels, proceeding from the cicatrix, and reaching beyond the poles of the lens. As far as this layer follows the inner surface of the anterior capsule, no lens epithelium is found; beyond this it is preserved unchanged. The spindle-shaped cells enclose a layer of destroyed lens substance and a nucleus of normal lens fibres.

That part of the equator of the lens which lies opposite the scar shows no pathological changes. The lens fibres and their granulated nuclei are clearly seen. The Zonula fibres of this side pass unchanged from the capsule to the ciliary body.

The adjacent part of the ciliary body is filled with round cells, which enclose a number of crystals of hæmatoidin. The retinal part in this place is much proliferated, and participates in the formation of a thin cyclitic membrane, which passes behind the lens to the cicatricial tissue of the other side. It presents fresh hemorrhages, many round cells, and some fatty detritus (probably remains of the lens, which escaped from the capsule).

The ciliary nerves show no pathological change whatever.

The posterior parts of the choroid are thickened everywhere. The parenchyma has lost its peculiar structure, being converted into a mass of round cells, which encloses the remains of the destroyed pigment cells. Between the choroid and retina a sero-purulent exudation with fresh blood-clots is found.

The thickened sclerotic is contracted around the optic nerve. Its vessels are hyperæmic, and their lymph-sheaths dilated. The lamina cribrosa is thickened. Immediately after the entrance of the optic nerve the retina is detached. The papilla is thickened by connective-tissue proliferation. The layer of nervous fibres of the retina is œdematous. The ganglionic cells are remarkably

few in number. The other retinal layers manifest an increase of round cells. Round cells are also to be seen in the peripheral parts of the layer of nervous fibres and the inner layers of the sclerotic.

Anatomical Diagnosis.—Phthisis anterior; vulnus corneo-sclerale, with imprisonment of the iris, ciliary body, and lens; cataracta traumatica; iritis purulenta; cyclitis plastica et purulenta; choroiditis purulenta; detachment of the retina; retinitis; atrophy of the retina and optic nerve.

19.

The following eye was enucleated by *Dr. Knapp* for sympathetic iritis. Ch. E., æt. 17, had suffered an injury of the left eye two years previously, and three months preceding the enucleation was the subject of sympathetic iritis in the right eye. The globe is small. The centre of the cornea presents a cicatrix, to which the iris is attached. The ciliary body is atrophic. The lens seems to be absent. The retina is detached, and crowded forward. The posterior section of the sclerotic is much thickened. The anterior chamber is filled with blood, and the vitreous space with a serous exudation.

The microscope reveals the following: The cornea is of nominal thickness, and a little sunken in its centre. The epithelial layer is somewhat thickened in the centre of the cornea, and penetrates Bowman's layer. Thence a narrow strip of cicatricial tissue passes almost perpendicularly through the vascularized cornea. Descemet's membrane is curved outward into the canal of the wound. Its endothelium is normal only in its periphery, and, as it approaches the scar, it becomes transformed into a fine tissue composed of spindle-shaped cells, which is continued over the anterior surface of the iris. The entire anterior chamber is filled with fresh blood.

The periphery of the iris on both sides (meridional sections) is attached to Descemet's membrane, and infiltrated with extravasated blood. Thence it proceeds, as an atrophic strip of connective tissue, towards the corneal cicatrix. Just before its insertion it is much swollen, folded, and saturated with round cells. No vestige of the sphincter iridis remains. The uveal pigment of the iris is loosened, and protrudes, in narrow

strips, into the serous exudation which fills the vitreous chamber.

The ciliary body is atrophied. Its muscular fibres are compressed.

The ciliary nerves are well preserved, and show no pathological changes.

The choroid, near the ciliary body, is atrophic. The remainder of it is very hyperæmic, and rather thickened. Upon the lamina vitrea choroideæ lie a few colloid excrescences.

The ciliary part of the retina is somewhat thickened, and firmly united to the rest of the retina, which is detached, and converted into connective tissue.

Anatomical Diagnosis.—Phthisis anterior; vulnus cornea, with imprisonment of the iris; atrophy of the entire uveal tract; detachment and atrophy of retina.

20.

The following eye was given me by *Dr. Knapp*. It was enucleated for sympathetic iritis serosa of the other eye.

The record shows that K. B., æt. 9, had thrust a pin into his eye seven years ago. The subsequent inflammation subsided under the care of a physician. He presented himself May 24, 1876, with the following conditions: *Left*—Irido-choroiditis chronica, with complete synechia and total loss of vision. *Right*—Iritis serosa sympathica. The enucleation was followed by such rapid improvement that the patient could be discharged the 29th of the same month. He soon returned, however, with a renewed inflammation in the form of irido-cyclitis plastica. His vision, which had been normal, had sunken to $\frac{2}{200}$. There was complete circular synechia. The eye improved under the ordinary treatment. The effort to improve sight and the conditions of the eye by an iridectomy proved futile to a certain extent, because the coloboma slowly closed again. He was discharged in the middle of July, without any inflammatory manifestations. V = $\frac{20}{200}$. Prognosis doubtful; rather unfavorable.

The globe is reduced in size, and the cornea flattened. Section shows the corneal tissue to be much thickened. The iris is firmly attached to the cornea. A cyclitic membrane traverses the eye behind the iris, and is connected with the detached retina. A small quantity of a flocculent fluid is found between retina and choroid. The inner surface of the choroid is studded with gran-

ules. The optic nerve is very thin. The sclerotic is thickened, especially around the entrance of the optic nerve. No vestige of the lens is perceptible.

The microscope reveals the following: The epithelium of the cornea is somewhat thickened at the site of the old cicatrix. Beneath this a tough, laminated cicatricial tissue is found, which extends as far as Descemet's membrane, and is markedly different from the normal corneal tissue. The rest of the corneal parenchyma is more or less thickened, and also manifests an irregularly laminated structure. The number of its cell elements is materially reduced. There is a slight degree of vascularization. Descemet's membrane, to which the iris is firmly adherent almost everywhere, is drawn towards the centre of the cornea. Its endothelium is substituted to a great extent by delicate, spindle-shaped cells, which unite it with the iris. The spindle-shaped cells are evidently transformed endothelium cells of Descemet's membrane and of the anterior surface of the iris. This can be clearly demonstrated at such places where the adhesion is not complete. Many endothelium cells there are seen to be stretched, and others are converted into complete spindle-shaped cells. Besides the spindle-shaped cells, many round cells are found, and nuclei without protoplasma.

The periphery of the iris and the ciliary body are drawn towards the centre of the cornea. The pupil is completely occluded. The parenchyma of the iris is thickened, and replete with round cells. The number of vessels is reduced, while their calibre is considerably increased. The pigment cells of the parenchyma are destroyed, and their pigment is free. The uveal pigment is considerably spread out, and irregularly arranged. No trace of the sphincter iridis. The posterior surface of the iris is covered by a dense cyclitic membrane, which has a laminated structure, resembling that of the corneal tissue. It is vascularized and encloses between its fibres some free pigmented and round cells; between the iris and the cyclitic membrane a small part of the capsule and lens substance is found. The latter is almost entirely calcified.

The parenchyma of the choroid is less filled with round cells than the iris and ciliary body. The pigment cells are decaying, and the pigment is scattered about. The choroidal vessels

are mostly distended with blood. The lamina vitrea is studded with colloid excrescences. In some places they are so numerous as to cover the entire field of vision, and are separated only by a string of epithelial cells. They abound and are chalky near the entrance of the optic nerve; whereas towards the periphery they are scarce, and are almost free from lime.

Notwithstanding the suppurative inflammation of the entire uveal tract, the ciliary nerves show no pathological change.

The retina is almost entirely transformed into connective tissue. Its folds enclose vitreous substance, pigment, and the colloid excrescences of the lamina vitrea choroideæ. This last condition justifies a presumption that the formation of the colloid excrescences preceded the retinal detachment. Furthermore, a number of chalky concrements are found in the retina.

The entrance of the optic nerve is contracted. The lamina cribrosa consists of large bundles of coarse connective tissue, through which no nervous fibres pass. Behind the sclerotic the nervous fibres are again visible, and there are surrounded by proliferating connective tissue.

A small quantity of a thin flocculent fluid is found between the detached retina and choroid. The flocculi consist of little bodies of protoplasm, free nuclei, and little drops of fat. The globules of protoplasm contain pigment granules, and vary greatly in shape and size, some having but twice or thrice the diameter of white blood-corpuscles, others twenty or thirty times. Some have a nucleus. I do not know which is the origin of these protoplasmic masses.

Anatomical Diagnosis.—Phthisis anterior; vulnus corneæ; synechia anterior totalis; cataracta calcaria; irido-choroiditis purulenta; colloid excrescences, with chalky deposits; detachment and atrophy of retina; atrophy of the optic nerve.

21.

The following eye was enucleated by *Dr. Knapp*, in Heidelberg. The record says:

J. A., æt. 31, presented himself at the hospital, April 4, 1867. He stated that his eye had been injured several days previously by a piece of wood. *Stat. præs.* At about 1‴ from and parallel to the corneal margin a laceration of the cornea, 3‴ in length, is found, which is filled

with prolapsed iris. The iris is moderately inflamed, the lens swollen and opaque; marked ciliary injection. The patient was admitted to the hospital, and treated there nineteen days; when he left, marked ciliary injection was still present. On May 28, he returned and stated that, soon after his discharge, the right eye manifested photophobia, some redness and pain, which increased *pari passu* with the decrease of vision.

Present condition L.: Near the corneal margin a vertical scar 3‴ long enclosing iris; pupil medium, dull, grayish-white on the nasal, and yellowish-red on the temporal side; circum-corneal injection least marked above; iris hyperæmic and discolored; intense photophobia; no particular painfulness upon pressure in the ciliary regions; perception of light without correct projection. *R.:* Photophobia; pain spontaneous and upon pressure; circum-corneal injection; aqueous humor turbid; pupil contracted; iris swollen and very hyperæmic; fundus not illuminable; fingers counted at 3′ with difficulty. Tn.

Dr. Knapp enucleated the eye the same day. Patient was discharged, on the 16th of July, with complete occlusion of the pupil.

The globe is rather under normal size, from flattening of the cornea. A somewhat indrawn scar is found near the corneal margin. Section shows the iris thickened and its periphery caught in the cicatrix. The opposite side of the ciliary body detached, drawn forward and inward, which is probably in consequence of the retraction of a broad cyclitic membrane. The choroid is considerably thickened, especially in its posterior part. The retina is united with the ciliary membrane, is detached in shape of a funnel, and its folds seem thickened. The sclerotic is thickened in such a manner as materially to contract the entrance of the optic nerve.

Microscopic Investigation.—The corneal scar consists of a funnel-shaped strip of tissue, which traverses the corneal tissue, and is of irregularly laminated structure, and strongly vascularized. Bowman's membrane accompanies the cicatricial tissue, on both sides, for a short distance. It encloses much free pigment, vessels, one cilia, and many round cells. The cilia is surrounded by a simple layer of epithelial cells.

At the posterior surface of the cornea, the wavy Descemet's membrane is partly enveloped in new-formed tissue. The cicatricial tissue is continued through the periphery of the iris and

united with a cyclitic membrane. Then it encloses the capsule of the lens, which is much folded. In lieu of the lens substance, the folds, especially those of the anterior capsule near the wound, enclose a dense tissue composed of round and spindle-shaped cells.

The parenchyma of the iris is thickened to about three times its size. Upon its posterior surface is a tissue directly connecting with and completely resembling that enclosed by the lens capsule. The anterior surface of the iris is markedly undulated. The iris tissue is sparsely vascularized, and filled with round cells. Its pigment cells are destroyed, and their free pigment lies scattered about among the round cells. The cells of the uveal pigment are detached, and their pigment is free to a great extent.

The ciliary body is densely packed with round cells, and its muscular structure somewhat reduced. The few vessels discernible are hyperæmic. The part of the ciliary body near the wound has maintained its normal relationship to the sclerotic, while the opposite part is detached, and at the same place the periphery of the iris is torn. The muscular fibres of the ciliary body do not seem to have participated in the pyogenic process. The retinal part of the ciliary body is thickened and united with the corneal cicatrix, by means of a dense connective tissue, into which the uveal pigment of the ciliary body is drawn.

The parenchyma of the choroid is much thickened and filled with round cells. The pigment epithelium and the pigmented cells of the parenchyma are undergoing destruction. Those of the latter cells which are preserved are abnormally small and darkly pigmented, and, while their pigment is remarkably granular, no nucleus can be found. Free pigment is scattered about everywhere. These changes are more expressed in the chorio-capillary than in the outer choroidal layers. The vessels, reduced in number, are dilated and hyperæmic. The somewhat undulating lamina vitrea is easily recognizable.

The ciliary nerves are normal everywhere.

The lamina fusca is filled with round cells, and its pigment shows the changes that were found in the choroid.

The layer of nervous fibres of the retina shows an abundant infiltration of round cells. This is the case with the outer layers,

thus permitting no differentiation between the inner and outer granular layers, but representing a mere mass of round cells. The ganglion cells appear atrophied, and several have been converted into hyaline vesicles (colloid ?).

The optic disc and nerve show a considerable thickening of their connective-tissue elements. The nerves are atrophied, and have undergone partial fatty degeneration.

The sclerotic is thickened. The ciliary nerves, where they pierce the sclerotic, are normal.

Anatomical Diagnosis.— Phthisis anterior; vulnus corneo-sclerale with incarceration of the iris; panophthalmitis purulenta; neuritis, with beginning atrophy of the optic nerve; cataracta traumatica; detachment of the ciliary body.

The following nine eyes were enucleated on account of sympathetic iritis, and are described in literature.

Graefe's Archiv.

IV. 1, p. 363, *H. Müller.*—The globe is atrophied. The cornea presents a cicatrix, from which new-formed tissue extends backwards, envelopes the iris and ciliary body, and draws the ciliary body inward. Irido-choroiditis. The optic nerve has undergone granular and fatty degeneration.

VI. 1, p. 134, *C. Schweigger.*—Corneal scar. Lens is much swollen, containing a foreign body; chronic choroiditis.

VI. 2, p. 267, *C. Schweigger.*—An iridectomy had been performed. The iris lies in the cicatrix produced by the iridectomy. Purulent irido-cyclitis.

Klinische Monatsblätter.

1869, *Hirschberg.*—The globe was enucleated eight weeks after having received a contusion. It presents a corneal scar, to which the iris is attached by means of new-formed connective tissue. At the juncture of choroid and ciliary body, the choroid is detached. A cyclitic membrane proceeds from ciliary body through the globe. The supra-choroidal space is filled with an exudation. The ciliary nerves are normal.

Ophthalm. Hosp. Rep.

VI., p. 284, *Vernon, J. B.*—Five weeks previous to the enucleation the globe had received an injury to the ciliary region; a

prolapse of the iris was removed. The cicatricial tissue penetrates the sclerotic the entire thickness of the ciliary body, and proceeds inward attached to the iris. Lens absent. The vitreous space contains a yellow fluid.

Klin. Beobachtungen aus der Augenheilanstalt in Wiesbaden, 1862.—*Enucleatio bulbi, etc., by Hofr. Pagenstecher, M.D.; and Autopsies, by Dr. A. Pagenstecher.*

Page 54, 3.—Three years previous to the enucleation, reclination of a cataract had been performed. The cataract is found attached to the choroid by a new-formed tissue. The retina is detached.

Ibid. 4. (*Autopsy II.*)—Three years previous to the enucleation, division of a cataractous lens had been performed, and chronic irido-choroiditis supervened. After sympathetic manifestations had appeared in the other eye, an iridectomy was made. This was five weeks preceding the enucleation. Irido-choroiditis plastica and serosa. The pupil is closed by a new-formed membrane, which is partly ossified. The retina is detached.

Mooren. Sympathische Gesichtsstörungen.

To p. 83, *Iwanoff.*—Sympathetic manifestations followed an iridectomy for secondary cataract. The globe is much atrophied. In its lower and outer part, a capsulated piece of iron is found, which is attached to the ciliary body, choroid, and retina. The cornea is flat and thickened; in its centre there is a large cicatrix, which is united with the vitreous, the torn lens-capsule, and the iris. The other side of the iris is drawn towards the cicatrix. The remainder of the anterior chamber is filled with blood and pus; the ciliary body and adjacent choroid are detached and drawn forward. The ciliary body at the location of the foreign body is atrophied, and infiltrated with cells. Between it and the sclerotic there is a newly-formed membrane, in which the ciliary nerves are lost. Schwann's sheath of the nerves is thickened.

Boston Medical and Surgical Journal.

IV. Page 5. *Handy.*—The enucleation was made thirteen weeks subsequent to the injury. The vitreus has been converted into dark fluid. The lens is shrunken, and lies against a

corneal cicatrix. Thence a new-formed membrane proceeds to the ciliary body, which contains a small fragment of steel. The retina is detached.

III.

GLOBES ENUCLEATED FOR SYMPATHETIC IRIDO-CYCLITIS.

22.

The following eye was enucleated by *Dr. Pooley* on July 26th, 1875, for irido-cyclitis sympathica, and under the presumption that it contained a foreign body.

The globe is very small. A deeply-indrawn scar penetrates the centre of the cornea. After the section, it is seen that the scar is surrounded by a ring of anterior chamber, and connected with a dense cyclitic membrane, which envelops the ciliary body and draws it forward and inward towards the axis. Thus the posterior part of the ciliary body and the choroid are detached. The iris and lens are absent. The retina, around the entrance of the optic nerve, is detached. The optic nerve is atrophied. The cavities of the globe are filled with a serous fluid.

Microscopic Investigation.—The epithelial layer of the cornea is thickened, especially at the cicatrix, and at the same place Bowman's membrane is folded. The corneal lamellæ appear normal, but are pierced by a broad, strongly vascularized, cicatricial tissue composed of spindle-shaped and round cells. Descemet's membrane is remarkably thin. Its endothelium is well preserved and normal. The cicatricial tissue within the cornea contains remnants of the capsule.

The iris has entirely disappeared.

The insertion of the ciliary body is broader than normal. Upon it lies a tough cyclitic membrane, which is of a partly lamellar arrangement, and has only a few vessels. It implies the pars-ciliaris retinæ. The uveal pigment passes inward through the fibres of this membrane, which unites with the cicatricial tissue of the cornea. Remains of the capsule of the lens and the periphery of the retina, which has undergone connective tissue degeneration, are attached to its posterior surface.

The tissue of the ciliary body is much atrophied. Its vessels are partly hyperæmic.

The choroidal tissue shows the consequences of a chronic hyperæmia. Its veins are enlarged, and between them lies much connective tissue. Its pigment cells, as well as those of the pigment epithelium, are hardly changed.

The cellular elements of the retina are destroyed by formation of connective tissue. The ganglionic layer shows many cells which have undergone colloid degeneration. The entrance of the optic nerve abounds with connective tissue and vessels. The latter are filled with blood. The lamina cribrosa is much hypertrophied, and but few nervous fibres remain discernible.

The ciliary nerves do not manifest the least pathological change.

Anatomical Diagnosis.—Phthisis bulbi traumatica; entire absence of iris and lens; atrophy of the ciliary body, resulting from cyclitis plastica; detachment of the ciliary body and of the periphery of the choroid; chronic hyperæmia of the choroid; detachment of the retina; atrophy of the retina and optic nerve.

In literature I find that the following three eyes were enucleated for sympathetic irido-cyclitis:

Graefe's Archives.

XIV., 2, p. 328. *Berlin.*—The eye was glaucomatous, and an iridectomy has been performed. After enucleation, melanosarcoma of the choroid was found.

Utrechter Jahresbericht, 1865.

Page 41. *Maats, J. J.*, 3. The eye had become staphylomatous, in consequence of burning of the cornea. Six months after the burn the staphyloma was removed. Fourteen days later the eye was enucleated. The globe is phthisical. The vitreus contains pus. The retina is detached.

Injuries of the Eye, Orbit, and Eyelids. Geo. Lawson, 1867.

Page 214. CASE LXX.—Ten months previous to the enucleation the eye had suffered an injury to the cornea, with prolapse of the iris. The retina is œdematous, its connective tissue

swollen, especially its radial fibres. The choroid also is œdematous, and shows purulent infiltration. The pigment epithelium is swelled and partly destroyed. The vitreus contains a fibrinous exudation.

IV.

GLOBES ENUCLEATED FOR SYMPATHETIC IRIDO-CHOROIDITIS.

23.

The following eye was received from *Dr. Mooren*, and accompanied by the clinical diagnosis: Amaurosis following choroiditis traumatica, with persistent cyclitis; sympathetic ophthalmia of the other eye.

The globe is of normal dimensions. The corneo-scleral margin presents a small cicatrix. Section shows the iris to be drawn towards and healed into the scar. The anterior and vitreous chambers are filled with a gelatinous exudation, which is saturated with extravasations. The retina is partly detached. The entrance of the optic nerve is considerably thickened, but compressed in the scleral aperture.

The microscope reveals the following: The corneal tissue is vascularized, especially in its outer layers. The epithelium is thickened, and dips into the corneal substance at the cicatrix. Bowman's layer cannot be recognized. A tissue, composed of long, spindle-shaped and round cells, and many vessels, is found under the epithelium. At the point where the cicatrix pierces the cornea the layers of the latter are curved outward. The cicatricial tissue consists of delicate, spindle-shaped and round cells and new vessels. The iris lies in it, and its vessels connect with those of the cicatrix.

The parenchyma of the iris is replete with round cells. Its pigment is scattered about, and its vessels are engorged.

The lips of the wound of Descemet's membrane are bent outward into the canal of the wound.

In quite a number of sections taken from the place of attachment of the iris a great accumulation of epithelial cells is found, evidently thrown into the wound-canal where the injury occurred.

The free part of the iris is also densely filled with round cells.

The ciliary body shows an extensive production of round cells, and its vessels are greatly dilated. Its retinal part is slightly thickened.

The lens is wanting.

The ciliary nerves near the wound and in other parts of the eye are entirely normal. Occasionally a fibre is somewhat opaque by fatty infiltration.

The choroid is very hyperæmic. Along the vessels a sparse accumulation of white corpuscles is found. Its pigmented stroma cells of the choroid manifest no material pathological change.

The retina is œdematous, particularly near the entrance of the optic nerve. Here, that condition described by various authors, and delineated by Pagenstecher, is found, viz., oval cavities in the granular layers filled with fine threads of fibrin, as we find them in cases of Bright's retinitis. The layer of nervous fibres shows the remains of numerous hemorrhages.

The entrance of the optic nerve is thickened, congested, and œdematous. The connective tissue of the optic nerve is hypertrophic at the expense of the nervous elements.

Anatomical Diagnosis.—Vulnus corneo-sclerale, with incarceration of the iris; cyclitis purulenta; hyperæmia of the choroid; detachment of the retina; retinitis and neuritis optici; aphakia.

24.

The following eye was enucleated by *Dr. E. Gruening*, for sympathetic irido-choroiditis.

The clinical record presents the following points of interest:

G. H., æt. 14, presented himself Sept. 4, 1874, stating that six weeks previously a stone had struck his right eye. *Present Condition*: *R.* A cicatrix, which encloses the iris, traverses the cornea. The ciliary region is very painful on pressure and spontaneously. *L.* Photophobia and lachrymation. The father of the boy would not consent to the enucleation of the right eye until the 11th of the same month. Then the left was found to be in a state of violent iritis, reduction of vision to $\frac{5}{200}$, great photophobia and lachrymation. The left eye improved somewhat after the enucleation, but soon grew worse again. Notwithstanding most careful treatment for months, a pupillary membrane was forming; and,

when the patient was discharged, he could again count fingers at five feet only. He returned in the fall of 1875 with complete occlusion of the pupil, but good perception of light. Dr. Knapp endeavored to make a central pupil, but found it impossible to accomplish any material result, on account of a complete degeneration of the tissue of the iris.

The globe is small. The cornea is flattened, and shows a large cicatrix. The iris is adherent to the scar, and is thickened. The lens seems to be absent. The vitreous chamber is filled with an exudation. The posterior part of the sclerotic is more than doubled in thickness.

The cornea is thinned; its epithelium, however, is thickened. The thinning of the cornea is produced by sclerosis of its parenchyma. The broad scar in its parenchyma is composed of spindle-shaped cells, between which pigment and and many vessels are found. Bowman's layer and Descemet's membrane are twisted.

Tissue of the iris is united to the cicatrix. Its normal structure is converted into a tissue, composed to a great extent of round cells, filling the anterior chamber, and containing many vessels and remains of pigment. The sphincter iridis can yet be recognized. The pupil is plugged with dense connective tissue, arranged in lamellæ, with many round cells and vessels. Where this papillary membrane is united to the iris, it assumes so much of its appearance that only the remnants of the sphincter can serve as a line of demarcation between them. The periphery of the posterior surface of the iris is attached to the ciliary body and covered with new-formed tissue, which is composed of spindle-shaped and round cells, and represents a cyclitic membrane, which involves the retinal part of the ciliary body. This tissue contains many hemorrhages, and the capsule of the lens, which is folded. The lens substance has undergone fatty degeneration.

The inner layers of the ciliary body are filled with round cells, while the outer layers are expanded by a serous exudation. Its muscle and vessels appear to be atrophied.

The ciliary nerves manifest nothing abnormal. One of them, however, is compressed in one place; yet its elements are unchanged.

The outer layers of the choroid are swollen by a serous exuda-

tion, containing a small number of round cells with which the capillary layer of the choroid is saturated. The vessels of the choroid are dilated. The pigment cells of the parenchyma and the epithelial layer are decaying.

The optic nerve is very hyperæmic. The lymph sheaths of its vessels are dilated. Its nervous fibres appear normal. The layer of nervous fibres of the retina is atrophied. Müller's supporting fibres are thickened. Many of the ganglionic cells are converted into hyaline vesicles (colloid ?).

The conjunctiva presents a rare condition. It is very hyperæmic, and partly infiltrated with blood. Furthermore, it contains large canals and cavities with serous contents, in which a small number of round cells are suspended. The walls of this system of canals are lined with a delicate endothelium. This condition is doubtless one of lymphangiectasia of the conjunctiva.

Anatomical Diagnosis.—Phthisis bulbi; lymphangiectasia conjunctivæ; irido-cyclitis purulenta et plastica; choroiditis serosa; atrophy of the retina; hyperæmia of the optic nerve.

25.

The following eye was enucleated by *Dr. Pooley*, at the Insane Asylum at Utica, for sympathetic irido-choroiditis.

The globe is abnormally small. The corneo-scleral margin presents a scar, which extends into the ciliary body. A section shows the anterior chamber to be very deep and filled with an exudation. The corneal and scleral lips of the wound are much thickened. At its posterior surface a stump of iris is found. (I afterwards learned that an iridectomy had been made.) Opposite to the scar the sclerotic is somewhat thinned and ectatic. Behind the iris there is a large lens-shaped formation, which seems to consist partly of blood and partly of chalk. The retina is detached. The sub-retinal space is filled with an exudation, which contains many crystals.

Microscopical Condition.—The cornea is generally thinned, but thickened at the scar, where round cells and pigment lie between its lamellæ.

A laminated tissue, composed of spindle-shaped cells, proceeds from the cicatrix to the central end of the opposite part of the iris, enclosing the thickened, club-like stump of iris; and these

parts form together the posterior boundary of the anterior chamber. At this side the insertion of the iris is attached to the cornea, and thus appears broader. The normal structure of its parenchyma is lost; its tissue represents a mere mass of round cells with some remains of pigment. At its posterior surface lies a thin membrane, formed of the ciliary part of the retina, in which the uveal pigment of the iris loses itself.

This cyclitic membrane has drawn the posterior parts of the ciliary body and the neighboring choroid and sclerotic inward. A sero-purulent exudation lies between the atrophic muscular fibres of the ciliary body.

A similar exudation fills the meshes of the choroid, which thus appears thickened. The posterior parts of the choroid are very hyperæmic. Its inner layers, near the entrance of the optic nerve, contain an osseous plate. The lamina vitrea cannot be found under the bone.

The ciliary nerves are entirely normal.

The retina is detached, enclosing some vitreus, and is entirely converted into connective tissue with some pigment.

The exudation, which separates the retina and choroid, is of a serous nature, and encloses numerous crystals of cholesterin.

The lens-shaped body, surrounded by the new-formed membrane, is, as was stated under the macroscopical investigation, composed of blood and chalk. Its lenticular shape and sharp contour might have misled to the diagnosis of a so-called hemorrhagic cataract. But it is clearly seen that the chalky mass only substitutes the lens, and is entirely surrounded by the capsule, while the hemorrhage bears no relation to it.

The optic nerve is atrophic, and has undergone connective-tissue degeneration.

Anatomical Diagnosis.—Phthisis bulbi; cicatrix resulting from iridectomy, with enclosure of the iris; iritis purulenta; cyclitis serosa et plastica; choroiditis serosa, and ossification of the choroid; detachment of the ciliary body and choroid; atrophy and detachment of the retina; atrophy of the optic nerve; cataracta calcarea.

All of the following globes were received from *Drs. E. Wil-*

liams and *Ayres*, and were enucleated for pronounced sympathetic irido-choroiditis. The clinical history of four of these cases has been published by *Dr. Ayres* in these Archives, Vol. V., pp. 227–229.

26.

T. H., æt. 5.—When I received the globe, it had been opened, but appears to have been of normal size. Perhaps the cornea is somewhat flattened. The corneo-scleral margin has a scar. The iris is attached to the whole inner surface of the cornea. The iris, ciliary body, and choroid are considerably thickened. The lens appears normal, and is crowded against the iris by a cyclitic membrane. The optic nerve is attenuated. The adjacent part of the retina is thickened; the other parts are detached. It is questionable whether this was the case during life.

The following are the microscopical conditions: Some iris and Descemet's membrane lie in the corneal cicatrix. The tissue of the iris and ciliary body is converted into a continuous uniform mass of round cells. The uveal pigment of the iris is loosened and scattered about. The pigment cells of the parenchyma have entirely disappeared, and the tissue thus changed has no trace of vessels. That part of the mass of round cells, which corresponds to the ciliary body, presents minute muscular fibres at its outer part. It evidently took an active part in the production of the round cells. Some of these muscular fibres contain two or three nuclei, and the surrounding protoplasm is scant. The same applies to the muscular coat of the vessels, which are reduced in number.

The cyclitic membrane, in the formation of which the proliferating retinal layer of the ciliary body actively participated, presents but few round cells, vessels, and fresh hemorrhages.

The choroid—thickened some three or four times its natural diameter—consists almost exclusively of round cells. The pigment epithelium appears unchanged. The ciliary nerves appear unchanged.

The anterior capsule of the lens is attached to the iris and its posterior capsule to the cyclitic membrane. A part of the lens is absent; the remainder is partially normal, partially undergoing fatty degeneration.

The whole retina is infiltrated with round cells.

The substance of the optic nerve is full of round cells, which adhere particularly to its trabeculæ of connective tissue. Its vessels are hyperæmic.

Anatomical Diagnosis.—Vulnus corneo-sclerale, with imprisonment of the iris; purulent inflammation of the entire uveal tract; complete anterior synechia; cataracta traumatica; neuritis optici.

27.

H. H.—The globe is reduced in size from corneal flattening. A scar passes from one corneal margin to the other. Section reveals a dense band of new-formed tissue proceeding from the cicatrix behind the iris, which is connected with it, there to unite with a thick cyclitic membrane, which seems to enclose remains of the lens. At the juncture of the cicatricial tissue with the cyclitic membrane a large piece of a percussion-cap is found. Thence a tough band of tissue traverses the vitreous chamber, and draws the ciliary body, which is nearly doubled in breadth, forward and inward. The retina is entirely detached.

The following are the microscopical conditions: The cornea is much thinned and strongly vascularized; the lips of the wound are thickened, without, however, being filled with an unusual amount of cells. The epithelium over the scar is much thickened, and sends conical projections into the canal of the wound. The endothelium of Descemet's membrane is in a process of proliferation. The remainder of the anterior chamber encloses pus and detritus.

The cicatricial tissue which traverses the cornea presents the conditions before described. It is pigmented and vascularized. The iris is attached to it, and converted into a very broad mass composed of round cells, remains of pigment, and hemorrhages. It presents no remains of muscular tissue and but few vessels. Behind it lies also a new-formed tissue, in the formation of which the cicatricial tissue and a cyclitic membrane participate; the foreign body lies imbedded in dense layers of this new tissue, which also encloses the capsule of the lens, which is plicated and still contains remains of the lens. From it a band of tough connective tissue, enclosing vessels and fresh hemorrhages, extends backward to the sclerotic.

The course and arrangement of the fibres of the ciliary body

have been completely changed by the traction, and, furthermore, they are saturated with round cells. The muscular tissue of the ciliary body is atrophic, and its vessels are much reduced in number.

The choroid is much thickened, and has entirely lost its normal structure. It consists of round cells, among which are remains of the choroidal pigment and a few engorged vessels. The pigment epithelium is unchanged. Furthermore, in the ciliary region the sclerotic is transformed into cavernous tissue.

The ciliary nerves present no alteration. All the layers of the detached retina are filled with round cells, but still separately recognizable. Near the entrance of the optic nerve, remains of old hemorrhages are found. The place where the retina was pierced by the foreign body could not be found.

The optic nerve is saturated with round cells. The lamina cribrosa and the longitudinal trabeculæ of connective tissue are much thickened; some nervous fibres have undergone fatty degeneration.

Anatomical Diagnosis.—Vulnus corneæ; phthisis anterior; corpus alienum in bulbo; atrophy of the ciliary body after cyclitis plastica; recent purulent inflammation of the entire uveal tract and of the detached retina; neuritis optici; cataracta traumatica.

28.

F. W. R.—The globe is reduced in size by almost complete flattening of the cornea to which the iris and ciliary body are united. Both are drawn forward; a cyclitic membrane lies directly behind the iris; the sclerotic is somewhat, the optic papilla and its surroundings are much thickened.

Microscopical Examination.—The epithelium of the cornea is thickened. In the cicatrix the epithelium penetrates, through Bowman's layer which is ruptured, into the corneal parenchyma. The corneal parenchyma manifests a considerable cell-proliferation, and is traversed by a number of vessels around the scar. Descemet's membrane is detached and folded. Its endothelium is proliferating. The cicatricial tissue is composed as usual of long, spindle-shaped cells, which enclose vessels, pigment, and round cells, and connects with the iris.

The iris and ciliary body have lost their normal structure, being converted into a very vascular tissue containing many round and a few pigment cells. The sphincter of the iris has disappeared, and the muscular fibres of the ciliary body are atrophied.

In the supra-choroidal cavity is some sero-purulent exudation. The choroid is infiltrated with round cells. Its periphery presents a number of cavities, as are frequently found at the ora serrata in the retina. They vary in size, and have separate walls lined with endothelium. Thus they appear as cysts of the choroid; they may be, perhaps, varicose vessels only, with atrophic walls.

The changes in the retina correspond to those which are found in morbus Brightii. All its layers are œdematous and enlarged. The radial fibres are strongly marked. The intergranular layer seems to be the most enlarged. The layer of nerve fibres contains many round cells, and the inner- and intergranular layers show many small cavities filled with threads of fibrin. Furthermore, hemorrhagic spots are found.

The entrance of the optic nerve is also œdematous. The lamina cribrosa and the longitudinal trabeculæ of connective tissue of the optic nerve are strongly marked, and surrounded by round cells. The ciliary arteries, which enter through the sclerotic in the vicinity of the optic nerve, are surrounded by round cells. The ciliary nerves are unchanged.

Anatomical Diagnosis.—Vulnus corneo-sclerale; phthisis anterior; cyclitis plastica et purulenta; iritis and choroiditis purulenta; retinitis; neuritis optici; cataracta traumatica; formation of cysts in the choroid (?).

29.

W. M.—The globe is phthisical. The posterior section of the sclerotic is considerably thickened. The cornea presents a marginal scar, behind which a part of the iris is absent. Cicatricial tissue behind the corneal scar envelops the iris, and unites with a cyclitic membrane and the detached retina. The choroid is thickened.

The corneal scar is very broad and deeply pigmented. It is of the usual structure. It proceeds from the cornea to the ciliary body (the iris is wanting here) and to the opposite part of the

iris. Behind it granulation tissue projects from the ciliary processes. It is composed almost solely of round cells and threads of fibrin, among which the uveal pigment of the iris and ciliary body is scattered. This tissue contains minute remains of the lens substance, enveloped by the folded capsule. The tissue of the iris is much thickened, very little pigmented, and filled with round cells. Its vessels are engorged.

The ciliary body is also filled with round cells, leaving its muscular tissue barely discernible. Its vessels, reduced in number, are increased in calibre. At some places the round cells are crowded together in the form of little abscesses. The pars ciliaris retinæ is enlarged. That part of the periphery of the retina which lies upon it, as well as the entire band which goes to the optic nerve, has lost its normal structure, and is converted into connective tissue, full of round cells.

The tissue of the choroid consists merely of round cells and vessels. The pigmented stroma cells have disappeared. The cells of the pigment epithelium are disorganized. The vessels are dilated. The ciliary nerves are normal.

The lamina cribrosa and the perineurium internum are somewhat thickened, and interspersed with many round cells.

Anatomical Diagnosis.—Phthisis bulbi; vulnus corneo-sclerale; cyclitis plastica et purulenta; iritis et choroiditis purulenta; detachment and atrophy of the retina; neuritis optici; cataracta traumatica.

30.

Mrs. Br.—The globe is small and oval. A broad cicatrix is at the corneo-scleral margin, and another not far from the first, in the ciliary region. The iris and ciliary body are thickened and drawn into the cicatrices. A dense, new-formed tissue, containing particles of lens matter, but no retinal tissue, lies within the pupil, and fills the entire vitreous space. The choroid and retina are thickened, mostly around the entrance of the optic nerve.

The two cicatrices present no histological change. The corneal tissue is otherwise normal. The endothelium of Descemet's membrane is thickened in several places. The ligamentum pectina-

tum and the entire tissue which enters into the formation of the angle of the iris, are saturated with round cells.

The iris is densely filled with round cells, by which its normal thickness is increased three or four times.

The ciliary body and choroid are converted into a dense accumulation of round cells, presenting no trace of muscular tissue. The pigmented stroma cells of the entire uveal tract are destroyed. The ciliary nerves are unchanged. The tissue which fills the vitreous chamber is essentially composed of round, spindle-shaped cells, and fibrous strips, and many vessels. Several of these strips are doubtless degenerated retina.

The supra-choroidal cavity is obliterated. The inner layers of the sclerotic are densely infiltrated with round cells.

The optic nerve is attenuated. Its connective tissue hypertrophied, and its nervous fibres are reduced in number.

Anatomical Diagnosis.—Vulnus corneo-sclerale, with incarceration of the iris and ciliary body; irido-choroiditis purulenta et plastica; detachment and complete degeneration of the retina; atrophy of the optic nerve; cataracta traumatica.

31.

The following eye was enucleated by *Dr. Mooren*, because of sympathetic irido-choroiditis, and has already been described by me, in my "Contributions to the Path. Anat. of the Eye," under "A Case of Sub-conjunctival Dislocation of the Lens." The following is an extract therefrom:

A large cicatrix, enclosing ciliary, body, and remains of the iris, occupies the corneo-scleral region; a cyclitic membrane, proceeding from the scar, traverses the globe, and by its contraction has detached the ciliary body from the sclerotic. The iris and ciliary body are filled with round cells. Near the wound the choroid is likewise detached and saturated with round cells. The retina is detached, and has undergone connective-tissue degeneration; all the cavities of the eye are filled with a purulent and hemorrhagic exudation; under the conjunctiva and upon the cicatrix the somewhat cataractous lens is found.

The ciliary nerves are normal.

Anatomical Diagnosis.—Vulnus corneo-sclerale, with incarceration of iris and ciliary body; luxatio lentis subconjunc-

tivam; detachment of the ciliary body and choroid following plastic cyclitis; irido-choroiditis purulenta; atrophy and detachment of the retina.

The literature presents the following twenty-one cases, "enucleated for sympathetic irido-choroiditis."

(This series also includes such eyes as were briefly designated "enucleated for sympathetic *ophthalmia.*")

Graefe's Archives.

III., 2, p. 442, etc., *von Graefe.*—The cornea presents a large scar. The choroid and ciliary body are in a state of purulent inflammation. The lens is calcified, and the retina is detached.

XII., 2, *v. Graefe.*—A corneo-scleral scar encloses prolapsed ciliary body. Cyclitis plastica.

XV., 2, p. 9. *Iwanoff.*—From a corneal scar a band unites with a tough membrane, occluding the pupil. Iris drawn towards the scar. Purulent choroiditis.

Klinische Monatsblätter.

1864, p. 223. *H. Müller.*—Corneal scar enclosing the iris. Two large cysts between sclerotic and choroid.

1865, p. 3. *C. Pagenstecher.*—Seven months previous to the enucleation the eye suffered a contusion, which caused an almost complete detachment of the lens from the Zonula Zinnii. The iris is sunken and attached to the ciliary body by plastic exudation. The lens is cataractous. The entrance of the optic nerve is deeply excavated.

1871, p. 262. *Höring.*—About two months elapsed between the time of injury and enucleation. The corneo-scleral region shows a contracted cicatrix. The iris is attached to the cornea, and the lens to the posterior surface of the iris. A splinter of granite is found in the ciliary body, surrounded by pus and new connective tissue.

1872, p. 253. *Just.*—The iris is imprisoned in a corneal scar. Choroid and retina detached. The entire uveal tract shows purulent infiltration.

1873, p. 123. *Pagenstecher, Herm.*—A cicatrix is found in the corneo-scleral region. The iris is covered with a new-formed tissue, occluding the pupil. The retraction of a cyclitic membrane has detached the ciliary body. The entire uveal tract is thickened and in a state of purulent inflammation. The retina is detached.

Ophthalmic Hospital Report.

II. p. 11. *Bader.*—The eye was enucleated six weeks subsequent to an injury at the upper and outer ciliary region. The anterior part of the globe is entirely filled with new-formed tissue. The vitreus is flocculent. A little turbid fluid lies between retina and choroid. Retraction of the cyclitic membrane has drawn the ora serrata retinæ inward. The retina itself is hyperæmic and slightly opaque. The choroid is infiltrated with pus, especially in the region of the optic nerve and macula lutea.

V. 1. *Lawson, Geo.*—The globe was injured by a gun-cap, and enucleated seven years later. The globe is entirely atrophied, and contains the foreign body.

Klinische Beobachtungen aus der Augenheilanstalt zu Wiesbaden, 1862.

Hofr. Pagenstecher, M.D.—"Enucleatio-bulbi," etc.

Dr. A. Pagenstecher.—Autopsies.

Page 51, 1. (*Autopsy I.*).—Globe enucleated three months subsequent to injury. In the uveal tract purulent infiltration. Cornea converted into connective tissue. There is cellular infiltration along the vascular and nervous canals in the sclerotic.

7. *H. Müller.*—It was alleged that the eye suffered from an idiopathic inflammation three to four months before the enucleation. The retina is detached, thickened, and pushed forward. The thickening is the result of a conversion of the retinal elements into a tissue composed of spindle-shaped cells. The choroid shows a similar change. A fibrinous substance lies between retina and choroid, in the anterior and vitreous chambers, and between the folds of the retina. The lens is attached to the iris, the periphery of which is crowded forward by a fibrinous substance.

11. (*Autopsy X.*).—Patient suffered from an inflammation of

the eye five years previous to the enucleation. The anterior chamber is filled with blood, pus, and fibrin. The iris is attached to the cornea and lens by means of new-formed irido-cyclitic membranes, which entirely envelop the cataractous lens. The retina is detached and completely atrophic. The choroid is thickened everywhere, and filled with puriform elements. It contains a swelling the size of a hazel-nut, essentialy composed of round and spindle cells; its centre is decaying. (Sarcoma?) In the neighborhood of the swelling the sclerotic is hyperæmic and pigmented.

Utrecht Annual Report, 1865.

Page 58. *Maats, J. J. I.*—A cicatrix is found in the sclerotic, which encloses iris, ciliary body, choroid, and the capsule of the lens. A large ciliary nerve enters it. The opposite part of the ciliary body is hypertrophied. The choroid is much thickened and united to the sclerotic. The vitreus presents old hemorrhages, detritus, and cells. The retina is not discoverable.

Ibid. 2. The sclerotic presents a scar in front of the ciliary muscle, enclosing the iris, and covered with a new-formed tissue. A large ciliary nerve enters the cicatricial tissue. The remainder of the iris is attached to the cornea. The vitreus is shrunken.

Annales d' Oculistique.

1876, Jan. and Feb., p. 27. *Savary.*—Five months previous to the enucleation the eye was injured. A stone is found in the globe. The cornea is thickened at the cicatrix. The cataractous lens is attached to the corneal wound. The choroid and retina are drawn into a scleral scar. The retina is partly detached.

Archives of Ophthalmology and Otology.

II. 1. *Knapp, H.*—Irido-choroiditis chronica with ossification of the choroid. The retina is detached. The lens is calcified, and behind it a cyclitic membrane is found. The ciliary nerves are intact.

Ibid.—The eye had suffered a contusion five years previous to the enucleation. Old choroiditis with ossification is found. Furthermore, there is a recent irido-cyclitis with the formation

of a cyclitic membrane. The retina is detached; ciliary nerves normal.

Ibid.—Plastic irido-cyclitis; choroid ossified; retina detached.

Injuries of the Eye, Orbit, and Eyelids. By Geo. Lawson, 1867.

Page 214. CASE LXXIII.—The enucleation was made fourteen years subsequent to a traumatism. A piece of a percussion-cap, surrounded by new-formed connective tissue, lies upon the ciliary body. The retina is detached.

Atlas d. path. Anat. d. Augapfels. By H. Pagenstecher and C. Genth.

Pl. 38. fig. 12.—The eye had been injured twenty-seven years previous to the enucleation. The cornea presents a scar, which encloses the iris. The iris and ciliary body are thickened. The latter contains a foreign body. Sympathetic irido-choroiditis manifested itself six days subsequent to the enucleation.

V.

GLOBES ENUCLEATED FOR SYMPATHETIC AFFECTION OF THE RETINA.

32.

The following globe was enucleated by *Dr. Gruening*, for sympathetic neuro-retinitis. The clinical history of the case presents the following points of interest.

J. D., æt. 35, lost his left eye, some fourteen years ago, by a suppurative affection of the cornea, and wore an artificial eye upon the phthisical globe. Three weeks ago vision in the right began to diminish and an ophthalmoscopic examination showed the conditions of neuro-retinitis, ex morbo Brightii. The patient could count in the nasal half of F. fingers immediately before the eye, while in the other half he had no perception of light.

When he presented himself again sympathetic irido-choroiditis was

manifest. The left globe was then enucleated. Notwithstanding all therapeutic efforts, under alternating aggravations and improvements, the eye was finally lost. $+T_2$.

The size of the globe is diminished by flattening of the cornea. The cornea is thinned and the whole iris adherent to its posterior surface. The ciliary body and neighboring parts of the choroid appear enlarged. A thin cyclitic membrane lies upon the poste rior surface of the iris and upon the anterior part of the detached retina. The optic nerve is attenuated; the sclerotic is somewhat thickened; the space between retina and choroid is filled with exudation.

Microscopical Examination.—The epithelial coat of the cornea is very thin, and sends some conical prolongations into the centre of the corneal substance. Bowman's membrane cannot be differentiated. The iris is atrophied.

The ciliary body is drawn forward and so much inward, that the ciliary processes almost touch one another. This condition is produced by the retraction of the above-mentioned cyclitic membrane. The muscular fibres of the ciliary body are atrophied; the ciliary nerves manifest no pathological changes.

The choroid is atrophic and œdematous. Numerous colloid excrescences lie upon the hyaline membrane.

The folds of the capsule of the lens enclose disintegrated lens fibres and free pigment.

Branched figures of pigment occupy the inner retinal layers, and follow the course of the vessels, some of which enter into the ciliary body; the retina and optic nerve are completely converted into connective tissue.

Anatomical Diagnosis.—Cornea converted into cicatricial tissue; complete anterior synechia and atrophy of the iris; atrophy of the ciliary body, the result of cyclitis plastica; choroiditis serosa; colloid excrescences of the choroid; retinitis pigmentosa; detachment and atrophy of the retina; atrophy of the optic nerve.

The following four cases, recorded in literature, were enucleated for sympathetic neuro-retinitis.

Graefe's Archives.

XII., 2, *v. Graefe.*—A calcareous cataract, dislocated into the

anterior chamber, had been extracted. Plastic irido-cyclitis and choroiditis.

Ibid.—Chronic choroiditis with chalky deposits on the inner surface of the choroid. Retina detached.

Archives of Ophthalmology and Otology.

II. 1, p. 284. *Pooley, T. R.*—The eye was injured four weeks previous to the enucleation. A corneo-scleral scar encloses iris and ciliary body; purulent inflammation in the entire uveal tract; the ciliary nerves are normal.

Ibid.—The traumatism occurred forty years previous to the enucleation. Repeated inflammations produced staphyloma, finally rupture, and consequent atrophy of the globe. The iris and ciliary body are recognizable only by their pigment. The choroid is partly atrophied, partly affected with suppurative inflammation. Cyclitic membrane; retina detached and atrophic.

VI.

The two following globes, as reported in literature, were enucleated for

SYMPATHETIC AFFECTION OF THE CORNEA.

Utrecht Annual Report, 1865.

Page 58. *Maats I. I.*, 3.—Ten months subsequent to an injury of one eye, sympathetic irritation of the other occurred, two phlyctenæ appearing at the upper corneal margin, "as in scrofulous ophthalmia." The retina is detached in stripes; its periphery lies behind the lens. The ciliary muscle is swollen; pseudo-membranes lie upon the choroid; the ciliary nerves manifest fatty degeneration.

Klinische Beobachtungen aus der Augenheilanstalt zu Wiesbaden, 1862.

AUTOPSY VI., *A. Pagenstecher.*—Clinical diagnosis: staphyloma corneæ, following acute granulations; staphyloma removed,

with partial removal of the lens; pain and conjunctival injection remaining. Enucleation made, while there was still quantitative perception of light, on account of obstinate superficial keratitis, attributed to sympathetic influences. The cornea is substituted by a staphylomatous cicatricial tissue. The pupil is closed by a dense membrane, which draws the few remains of the lens and the ciliary body towards the staphyloma. The choroid and retina are normal.

STATISTICS OF 110 CASES.

TABLE I.

I. *Eyes enucleated for sympathetic irritation.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Corneo-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
A. Alt. 1.		Scar in the lower half.		Purulent cyclitis.	Purulent iritis.	Hemorrhages and fibrinous masses in the vitreous body.	Chorioiditis in the region of the scar. Hyperæmia.	Degenerated into connective tissue in the cicatricial region. Infiltrated with round cells in its peripheric portions.	Intra-ocular granuloma of the optic nerve. Atrophy.	Normal. One lies in the tissue of the scar.
2.		A staphylomatous scar.		Detachment produced by hemorrhage. Hyperæmia.	Hyperæmia.	Soft cataract.	Detachment produced by hemorrhage. Hyperæmia.	Atrophy. Hemorrhages.	Excavation. Atrophy.	Normal.
3.	Proliferation of the endothelium.			Cyclitis. Hemorrhages.	Purulent iritis.		Plastic choroiditis.	Fibrinous exudation lying upon the yellow spot.		Normal.
4.				Atrophy after plastic cyclitis.	Periphery adherent to cornea and infiltrated with round-cells. Pupillary edge atrophic. Vitreous membrane.	Chalky cataract, dislocated down and backward.	Serous and plastic choroiditis. Ossification.	Detachment and degeneration into connective tissue.	Atrophy.	Normal.
5.			Scar with incarceration of iris and ciliary body.	Plastic cyclitis. Filled with sero-purulent exudation.	Purulent iritis.		Serous choroiditis.			Normal.
6.	Scar and purulent keratitis			Purulent cyclitis.	Purulent iritis.	Purulent hyalitis.	Purulent choroiditis.	Detachment. Atrophy.	Atrophy.	Normal.
7.	Flat. Scar.	Scar.	Scar.	Scar, drawn inward by cyclitic membrane and filled with sero-purulent exudation.	Purulent iritis.	Cataract.	Sero-purulent choroiditis.	Detachment. Œdema.		One compressed at two places. Otherwise normal.
8.			Scar.	Plastic cyclitis. Drawn forward.	Torn in one place. Occlusion of pupil.	Cataract.	Venous hyperæmia.	Atrophy.	Neuritis optici.	Normal.

9.			Scar, in which ciliary body and retina are embedded.	Detached. Old hemorrhages. Plastic cyclitis.	Atrophy.	Small cataractous remnants.	Venous hyperæmia.	Detachment. Atrophy and pigmentation.		Normal.
10.	Indrawn scar with incarceration of iris.			Drawn forward. Plastic cyclitis.	Purulent iritis.	Cataract.	Venous hyperæmia.	Detachment. Œdema of yellow spot. Otherwise atrophy.	Excavation. Atrophy.	Normal.
11.			Indrawn scar with incarceration of iris after extraction of cataract.	Purulent cyclitis.		Purulent hyalitis.	Detachment. Purulent choroiditis.	Atrophy.	Œdematous.	Normal.
12.	Scar in which iris is embedded.				Atrophy.	Cataract.	Atrophic choroiditis. Sclerochoroiditis posterior.	Partially detached. Atrophic patches.	Excavation.	Normal.
13.	Two scars in which iris is embedded.			Cyclitis.	Atrophy after plastic iritis. Occlusion of pupil.		Choroiditis. Hemorrhages. Colloid excrescences with chalky deposits.	Partially detached. Some atrophy.	Excavation.	Normal.
14.				Plastic cyclitis.	Contracted. Anæmic.	Dislocated backwards. Intraocular hemorrhage.	Serous choroiditis.	Detachment. Atrophy.		
15.	Scar.		Scar in which a foreign body is embedded.	Cyclitis.	Iritis.	Cataract.	Old chorioiditis, with atrophy. New choroiditis.	Old Retinitis. Atrophy.	Atrophy.	Normal.
H. Müller.		Sclerectasia.		Cyclitis.	Iritis.	Capsular cataract.	Choroiditis.	Detachment.		Atrophic.
Iwanoff.							Purulent choroiditis.			
Iwanoff.						Vitreous chamber filled with blood.	Hypertrophy of connective tissue.			Thickened neuroglia. Round-cell infiltration.
"				Detached. Plastic cyclitis.		Depressed cataract adherent to the ciliary body.	Detached.			
"			Scar after extraction of cataract.	Sero-purulent cyclitis.	Sero-purulent iritis.	Hyalitis.	Sero-purulent choroiditis.			
Brecht.			Scar.	Plastic cyclitis.	Plastic iritis.		Detached.	Detached.		
Geo. Lawson.	Scar.				Iridodialysis.	Dislocation into the vitreus.	Detached.	Detached.		

TABLE I. Continued.

I. *Eyes enucleated for sympathetic irritation.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Cornea-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
Geo. Lawson.		Scar in ciliary region, embedding ciliary body and choroid.		Foreign body in ciliary body. Purulent cyclitis.				Detached.		
Vernon.		Scar in ciliary region.		Scar. Plastic cyclitis.	Lens wanting.		Detached.			Some lie in the cicatricial tissue.
"		Scar near the entrance of the optic nerve.	Scar after extraction of cataract.		Scar in iris.	Scar-tissue passing through the vitreous body.		Partially detached.	Foreign body lying on the extraocular part of the optic nerve.	
"		Two scars, in one of which the iris is embedded.		Plastic cyclitis.	Plastic iritis.			Detached.		
"		Indrawn scar in the ciliary region.		Plastic cyclitis.				Detached.		
"	Scar in the total anterior part of the globe.					Lens and vitreous wanting.		Detached.		
"		Scar.	Scar in which choroid and retina are embedded.			Lens wanting.		Detached.		
Brayley.			Scar with incarceration of iris.	Foreign body in ciliary body. Cyclitis.		Cataract.		Œdema.		
Hofr. Pagenstecher.	Scar.			Purulent cyclitis.	Purulent iritis.	Lens wanting. Vitreous chamber filled with new-formed connective tissue with foreign body in it.	Choroiditis plastica.	Detached.		
A. Pagenstecher.	Scar in which iris is embedded.						Colloid excrescences. Ossification.	Detached.		

A. Pagenstecher.	Old scar. New keratitis				Atrophy.		Ossification.	Detached.		
"	Scar.				Iritis. Anterior synechia.	Lens shrunken. Foreign body in vitreo. Purulent hyalitis.		Detached.		
"				Powder grains in ciliary body. Purulent and plastic cyclitis.	Purulent iritis.	Purulent hyalitis.	Purulent choroiditis.			Normal.
I. I. Maats.				Plastic cyclitis.	Plastic iritis.		Atrophic patches.	Detachment and pigmentation.	Excavation.	
"					Iris wanting.	Lens wanting. chalky deposits in vitreo.				
"	Keratitis.		Scar after iridectomy.	Atrophy.	Partially iritis, partially atrophy.			Atrophy.	Excavation.	
"		Staphyloma.			Atrophy.	Small remnants of cataract.	Detached around the disc. Otherwise firmly attached to sclerotic.	Detached.		
"	Scar in which iris is embedded.			Purulent cyclitis.	Iritis. Anterior synechia.	Cataract. Purulent hyalitis.	Foreign body in choroid.	Detached.		
"			Scar after extraction of cataract with incarceration of iris.	Cyclitis plastica. Chalky deposits.				Detached.		
"				Plastic and purulent cyclitis.	Purulent iritis.	Foreign body in vitreo. Purulent hyalitis.		Detachment. Atrophy.		
Schiess-Gemuseus.				Plastic cyclitis. Foreign body in cyclitic membrane.		Shrunken cataract.	Ossification.	Detachment.		Chalky deposits in the neurilemma.
Iwanoff.				Plastic and purulent cyclitis. (Specific?)	Iritis gummosa.	Cataract.	Hyperæmia.	Œdema.		Schwann's sheath thickened. Number of nuclei increased.
"	Scar with incarceration of iris.	Scleritis and episcleritis.		Detached cyclitis plastica. New cyclitis. Cysts between ciliary body and cyclitic membrane.	Iritis. Anterior synechia.	Cataract. Hyalitis.	Detached.	Atrophy. Round-cell infiltration in the periphery.		

TABLE I. Continued.

I. *Eyes enucleated for sympathetic irritation.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Cornea-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
Iwanoff.			Scar after extraction of cataract in which Iris and lens-capsule are lying.	Plastic cyclitis. Part opposite the scar detached.		Vitreous chamber filled with exudation.				
Aug. Prichard	Scar.		Lens-capsule lying on the ciliary body.			Lens-substance absorbed.	Detached by fibrinous exudation.			One much swo.
Bader.					Vessels of iris are varicose. Plastic iritis.	Cataract.		Detachment.		
H. Knapp.	Scar.			Scar. Plastic cyclitis.	Scar. Plastic iritis.	Cataract.	Ossification.	Detachment.		
Leber.	Scar.		Foreign body upon the normal ciliary body.			Purulent circumscribed hyalitis.			Increase of connective tissue.	
Waldeyer.							Chronic choroiditis. Atrophy.	Fibrous exudation on retina.		
"								Hemorrhage and formation of folds at the macula lutea.		
Lawson.		Scar in ciliary region in which ciliary body and choroid are imbedded.		Foreign body. Purulent cyclitis.		Cataract.		Detachment.		
"		Scar in ciliary region.			Iris wanting.	Lens wanting. Vitreous chamber filled with blood.	Detached.	Detached.		
"	Scar.						Ossification.	Detachment.		
"	Scar with chalky deposits.						Ossification.	Detachment.		

II. *Eyes enucleated for sympathetic iritis.*

A. Alt. 16.	Scar.			Plastic and serous cyclitis.	Purulent iritis. Anterior synechia.		Hypertrophy after choroiditis.	Detached.	Atrophy.	Not discoverable.
17.	Scar.			Atrophy after cyclitis.	Plastic iritis.		Atrophy. Colloid metamorphosis of the pigment-epithelium. Colloid excrescences.	Detachment. Atrophy. Pigmentation and ossification.	Atrophy.	Normal.
18.		Scleritis.	Scar to which iris, ciliary body and lens are adherent.	Plastic cyclitis.	Partial atrophy. Partial purulent iritis.	Cataract.	Purulent choroiditis.	Detachment. Œdema.	Atrophy.	Normal.
19.	Scar with incarceration of iris.			Atrophy.	Hemorrhages (hemorrhagic iritis). Atrophy.	Lens wanting.	Partial atrophy. Partial hyperæmia.	Detachment. Atrophy.		Normal.
20.	Scar.			Drawn forwards. Purulent cyclitis.	Purulent iritis. Anterior synechia.	Chalky cataract.	Purulent choroiditis. Large number of colloid excrescences.	Detachment. Atrophy. Chalky deposits.	Atrophy.	Normal.
21.			Indrawn scar with adhesion of iris.	Plastic and purulent cyclitis detached. Opposite to the scar.	Purulent iritis.		Purulent choroiditis.	Retinitis. Partial atrophy.	Neuritis. Proliferation of connective tissue.	Normal.
H. Müller.	Scar.			Plastic cyclitis.	Plastic iritis.		Choroiditis.		Fatty degeneration.	
Schweigger.	Scar.					Foreign body in lens. Cataracta intumescens	Chronic choroiditis.			
"			Scar after iridectomy with incarceration of iris.	Purulent cyclitis.	Purulent iritis.					
Hirschberg.	Scar with incarceration of iris.			Plastic cyclitis.			Detached.			Normal.
Vernon.		Scar in the ciliary region with adhesion of iris.		Scar.	Plastic iritis.	Lens wanting.				

TABLE I. Continued.

II. *Eyes enucleated for sympathetic iritis.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Corneo-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
A. Pagenstecher.				Plastic cyclitis.	Plastic iritis. Ossification of pupillary membrane.		Serous and plastic choroiditis.	Detached.		
Hofr. Pagenstecher.						Lens depressed.	Lens adherent to choroid.	Detached.		
Iwanoff.	Scar with adhesion of vitreus, lens-capsule and iris.		Scar after iridectomy.	Detached. Cyclitis. At one place where a foreign body lies upon it, atrophy.	Purulent iritis.		Detached.			Nerves making part of the scar-tissue. Schwann's sheath thickened.
Handy.	Scar.			Plastic cyclitis. Foreign body in the cyclitic membrane.		Old hemorrhage in vitreo. Lens shrunken, adherent to cornea.		Detached.		

III. *Eyes enucleated for sympathetic irido-cyclitis.*

A. Alt. 22.	Indrawn scar			Atrophy after plastic cyclitis. Detached.	Iris wanting.	Lens wanting.	Detached. Chronic hyperæmia.	Detached around the disc. Atrophy.	Atrophy.	Normal.
Berlin.			Scar from iridectomy.				Melanosarcoma of choroid.		Excavation.	
I. I. Maats.	Scar.					Purulent hyalitis.		Detachment.		
Geo. Lawson.	Scar with prolapse of iris.					Fibrinous exudation in vitreous chamber.	Sero-purulent choroiditis.	Œdema. Proliferation of connective tissue.		

IV. *Eyes enucleated for sympathetic irido-choroiditis.*

A. Alt. 23.			Scar with incarceration of iris.	Purulent cyclitis	Purulent iritis.	Lens wanting.	Hyperæmia.	Partial detachment. Retinitis.	Neuritis optica.	Some fatty degeneration.
24.	Scar with adhesion of iris.			Plastic and purulent cyclitis.	Plastic and purulent iritis.	Traumatic cataract.	Serous choroiditis.	Atrophy.	Hyperæmia.	Normal. One is compressed.

25.			Scar after iridectomy. Adhesion of iris.	Plastic and serous cyclitis. Opposite to the scar detached.	Purulent iritis.	Chalky cataract.	Detached. Ossification.	Detachment.		Normal.
26.			Scar with incarceration of iris.	Purulent cyclitis.	Purulent iritis. Anterior synechia.	Cataract.	Purulent choroiditis.	Purulent retinitis.	Neuritis optica.	Normal.
27.	Scar.			Old plastic cyclitis. New purulent cyclitis.	Purulent iritis.	Cataract.	Purulent choroiditis.	Detachment. Purulent retinitis.	Neuritis optica.	Normal.
28.			Scar with adhesion of iris.	Drawn forward. Plastic and purulent cyclitis.	Purulent iritis.	Lens absorbed.	Purulent choroiditis. Cysts.	Retinitis. Œdema.	Optic neuritis.	Normal.
29.			Scar.	Plastic and purulent cyclitis.	Purulent iritis.	Cataract.	Purulent choroiditis.	Detachment. Atrophy.	Atrophy.	Normal.
30.		Scar in ciliary region. Scleritis.	Scar.	Plastic and purulent cyclitis.	Plastic and purulent iritis.	Purulent hyalitis, mere remnants of the lens.	Plastic and purulent choroiditis.	Detached. Atrophy.	Atrophy.	Normal.
31.			Scar in which iris and ciliary body are embedded.	Plastic and purulent cyclitis. Opposite to the scar detached.	Purulent iritis.	Lens dislocated under the conjunctiva.	Detached. Purulent choroiditis.	Detachment. Atrophy.		Normal.
V. Graefe.	Scar.			Purulent cyclitis.		Chalky cataract.	Purulent choroiditis.	Detachment.	Chalky deposits in optic nerve.	
"			Scar in which ciliary body is embedded.	Torn. Plastic cyclitis.						
Iwanoff.	Scar.				Plastic iritis.		Purulent choroiditis.			
H. Müller.	Scar with incarceration of iris.						Two large cysts between chorioid and sclera.			
C. Pagenstecher.				Cyclitis plastica.	Iritis.	Cataract.			Very deep excavation.	
Höring.			Indrawn scar.	Foreign body in ciliary body. Plastic and purulent cyclitis.	Anterior synechia.	Cataract.				
Just.	Scar with incarceration of iris.			Purulent cyclitis.	Purulent iritis.		Detached. Purulent choroiditis.	Detachment.		
H. Pagenstecher.			Scar.	Plastic and purulent cyclitis. Detached.	Plastic and purulent iritis.		Purulent choroiditis.	Detachment.		

STATISTICS OF 110 CASES.

TABLE I.

I. *Eyes enucleated for sympathetic irritation.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Corneo-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
A. Alt. 1.		Scar in the lower half.		Purulent cyclitis.	Purulent iritis.	Hemorrhages and fibrinous masses in the vitreous body.	Chorioiditis in the region of the scar. Hyperæmia.	Degenerated into connective tissue in the cicatricial region. Infiltrated with round cells in its peripheric portions.	Intra-ocular granuloma of the optic nerve. Atrophy.	Normal. One lies in the tissue of the scar.
2.		A staphylomatous scar.		Detachment produced by hemorrhage. Hyperæmia.	Hyperæmia.	Soft cataract.	Detachment produced by hemorrhage. Hyperæmia.	Atrophy. Hemorrhages.	Excavation. Atrophy.	Normal.
3.	Proliferation of the endothelium.			Cyclitis. Hemorrhages.	Purulent iritis.		Plastic choroiditis.	Fibrinous exudation lying upon the yellow spot.		Normal.
4.				Atrophy after plastic cyclitis.	Periphery adherent to cornea and infiltrated with round-cells. Pupillary edge atrophic. Vitreous membrane.	Chalky cataract, dislocated down and backward.	Serous and plastic choroiditis. Ossification.	Detachment and degeneration into connective tissue.	Atrophy.	Normal.
5.			Scar with incarceration of iris and ciliary body.	Plastic cyclitis. Filled with sero-purulent exudation.	Purulent iritis.		Serous choroiditis.			Normal.
6.	Scar and purulent keratitis			Purulent cyclitis.	Purulent iritis.	Purulent hyalitis.	Purulent choroiditis.	Detachment. Atrophy.	Atrophy.	Normal.
7.	Flat. Scar.	Scar.	Scar.	Scar, drawn inward by cyclitic membrane and filled with sero-purulent exudation.	Purulent iritis.	Cataract.	Sero-purulent choroiditis.	Detachment. Œdema.		One compressed at two places. Otherwise normal.
8.			Scar.	Plastic cyclitis. Drawn forward.	Torn in one place. Occlusion of pupil.	Cataract.	Venous hyperæmia.	Atrophy.	Neuritis optici.	Normal.

9.			Scar, in which ciliary body and retina are embedded.	Detached. Old hemorrhages. Plastic cyclitis.	Atrophy.	Small cataractous remnants.	Venous hyperæmia.	Detachment. Atrophy and pigmentation.		Normal.
10.	Indrawn scar with incarceration of iris.			Drawn forward. Plastic cyclitis.	Purulent iritis.	Cataract.	Venous hyperæmia.	Detachment. Œdema of yellow spot. Otherwise atrophy.	Excavation. Atrophy.	Normal.
11.			Indrawn scar with incarceration of iris after extraction of cataract.	Purulent cyclitis.		Purulent hyalitis.	Detachment. Purulent choroiditis.	Atrophy.	Œdematous.	Normal.
12.	Scar in which iris is embedded.				Atrophy.	Cataract.	Atrophic choroiditis. Sclerochoroiditis posterior.	Partially detached. Atrophic patches.	Excavation.	Normal.
13.	Two scars in which iris is embedded.			Cyclitis.	Atrophy after plastic iritis. Occlusion of pupil.		Choroiditis. Hemorrhages. Colloid excrescences with chalky deposits.	Partially detached. Some atrophy.	Excavation.	Normal.
14.				Plastic cyclitis.	Contracted. Anæmic.	Dislocated backwards. Intraocular hemorrhage.	Serous choroiditis.	Detachment. Atrophy.		
15.	Scar.		Scar in which a foreign body is embedded.	Cyclitis.	Iritis.	Cataract.	Old chorioiditis, with atrophy. New choroiditis.	Old Retinitis. Atrophy.	Atrophy.	Normal.
H. Müller.		Sclerectasia.		Cyclitis.	Iritis.	Capsular cataract.	Choroiditis.	Detachment.		Atrophic.
Iwanoff.							Purulent choroiditis.			
Iwanoff.						Vitreous chamber filled with blood.	Hypertrophy of connective tissue.			Thickened neuroglia. Round-cell infiltration.
"				Detached. Plastic cyclitis.		Depressed cataract adherent to the ciliary body.	Detached.			
"			Scar after extraction of cataract.	Sero-purulent cyclitis.	Sero-purulent iritis.	Hyalitis.	Sero-purulent choroiditis.			
Brecht.			Scar.	Plastic cyclitis.	Plastic iritis.		Detached.	Detached.		
Geo. Lawson.	Scar.				Iridodialysis.	Dislocation into the vitreus.	Detached.	Detached.		

TABLE I. Continued.

I. *Eyes enucleated for sympathetic irritation.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Corneo-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
Geo. Lawson.		Scar in ciliary region, embedding ciliary body and choroid.		Foreign body in ciliary body. Purulent cyclitis.				Detached.		
Vernon.		Scar in ciliary region.		Scar. Plastic cyclitis.	Lens wanting.		Detached.			Some lie in the cicatricial tissue.
"		Scar near the entrance of the optic nerve.	Scar after extraction of cataract.		Scar in iris.	Scar-tissue passing through the vitreous body.		Partially detached.	Foreign body lying on the extra-ocular part of the optic nerve.	
"		Two scars, in one of which the iris is embedded.		Plastic cyclitis.	Plastic iritis.			Detached.		
"		Indrawn scar in the ciliary region.		Plastic cyclitis.				Detached.		
"	Scar in the total anterior part of the globe.					Lens and vitreus wanting.		Detached.		
"		Scar.	Scar in which choroid and retina are embedded.			Lens wanting.		Detached.		
Brayley.			Scar with incarceration of iris.	Foreign body in ciliary body. Cyclitis.		Cataract.		Œdema.		
Hofr. Pagenstecher.	Scar.			Purulent cyclitis.	Purulent iritis.	Lens wanting. Vitreous chamber filled with new-formed connective tissue with foreign body in it.	Choroiditis plastica.	Detached.		
A. Pagenstecher.	Scar in which iris is embedded.						Colloid excrescences. Ossification.	Detached.		

A. Pagenstecher.	Old scar. New keratitis				Atrophy.		Ossification.	Detached.		
"	Scar.				Iritis. Anterior synechia.	Lens shrunken. Foreign body in vitreo. Purulent hyalitis.		Detached.		
"				Powder grains in ciliary body. Purulent and plastic cyclitis.	Purulent iritis.	Purulent hyalitis.	Purulent choroiditis.			Normal.
I. I. Maats.				Plastic cyclitis.	Plastic iritis.		Atrophic patches.	Detachment and pigmentation.	Excavation.	
"					Iris wanting.	Lens wanting. chalky deposits in vitreo.				
"	Keratitis.		Scar after iridectomy.	Atrophy.	Partially iritis, partially atrophy.			Atrophy.	Excavation.	
"		Staphyloma.			Atrophy.	Small remnants of cataract.	Detached around the disc. Otherwise firmly attached to sclerotic.	Detached.		
"	Scar in which iris is embedded.			Purulent cyclitis.	Iritis. Anterior synechia.	Cataract. Purulent hyalitis.	Foreign body in choroid.	Detached.		
"			Scar after extraction of cataract with incarceration of iris.	Cyclitis plastica. Chalky deposits.				Detached.		
"				Plastic and purulent cyclitis.	Purulent iritis.	Foreign body in vitreo. Purulent hyalitis.		Detachment. Atrophy.		
Schiess-Gemuseus.				Plastic cyclitis. Foreign body in cyclitic membrane.		Shrunken cataract.	Ossification.	Detachment.		Chalky deposits in the neurilemma.
Iwanoff.				Plastic and purulent cyclitis. (Specific?)	Iritis gummosa.	Cataract.	Hyperæmia.	Œdema.		Schwann's sheath thickened. Number of nuclei increased.
"	Scar with incarceration of iris.	Scleritis and episcleritis.		Detached cyclitis plastica. New cyclitis. Cysts between ciliary body and cyclitic membrane.	Iritis. Anterior synechia.	Cataract. Hyalitis.	Detached.	Atrophy. Round-cell infiltration in the periphery.		

TABLE I. Continued.

I. *Eyes enucleated for sympathetic irritation.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Corneo-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
Iwanoff.			Scar after extraction of cataract in which Iris and lens-capsule are lying.	Plastic cyclitis. Part opposite the scar detached.		Vitreous chamber filled with exudation.				
Aug. Prichard	Scar.		Lens-capsule lying on the ciliary body.			Lens-substance absorbed.	Detached by fibrinous exudation.			One much torn.
Bader.					Vessels of iris are varicose. Plastic iritis.	Cataract.		Detachment.		
H. Knapp.	Scar.			Scar. Plastic cyclitis.	Scar. Plastic iritis.	Cataract.	Ossification.	Detachment.		
Leber.	Scar.		Foreign body upon the normal ciliary body.			Purulent circumscribed hyalitis.			Increase of connective tissue.	
Waldeyer.							Chronic choroiditis. Atrophy.	Fibrous exudation on retina.		
"								Hemorrhage and formation of folds at the macula lutea.		
Lawson.		Scar in ciliary region in which ciliary body and choroid are imbedded.		Foreign body. Purulent cyclitis.		Cataract.		Detachment.		
"		Scar in ciliary region.			Iris wanting.	Lens wanting. Vitreous chamber filled with blood.	Detached.	Detached.		
"	Scar.						Ossification.	Detachment.		
"	Scar with chalky deposits.						Ossification.	Detachment.		

II. *Eyes enucleated for sympathetic iritis.*

A Alt. 16.	Scar.			Plastic and serous cyclitis.	Purulent iritis. Anterior synechia.		Hypertrophy after choroiditis.	Detached.	Atrophy.	Not discoverable.
17.	Scar.			Atrophy after cyclitis.	Plastic iritis.		Atrophy. Colloid metamorphosis of the pigment epithelium. Colloid excrescences.	Detachment. Atrophy. Pigmentation and ossification.	Atrophy.	Normal.
18.		Scleritis.	Scar to which iris, ciliary body and lens are adherent.	Plastic cyclitis.	Partial atrophy. Partial purulent iritis.	Cataract.	Purulent choroiditis.	Detachment. Œdema.	Atrophy.	Normal.
19.	Scar with incarceration of iris.			Atrophy.	Hemorrhages (hemorrhagic iritis). Atrophy.	Lens wanting.	Partial atrophy. Partial hyperæmia.	Detachment. Atrophy.		Normal.
20.	Scar.			Drawn forwards. Purulent cyclitis.	Purulent iritis. Anterior synechia.	Chalky cataract.	Purulent choroiditis. Large number of colloid excrescences.	Detachment. Atrophy. Chalky deposits.	Atrophy.	Normal.
21.			Indrawn scar with adhesion of iris.	Plastic and purulent cyclitis detached. Opposite to the scar.	Purulent iritis.		Purulent choroiditis.	Retinitis. Partial atrophy.	Neuritis. Proliferation of connective tissue.	Normal.
H. Müller.	Scar.			Plastic cyclitis.	Plastic iritis.		Choroiditis.		Fatty degeneration.	
Schweigger.	Scar.					Foreign body in lens. Cataracta intumescens	Chronic choroiditis.			
"			Scar after iridectomy with incarceration of iris.	Purulent cyclitis.	Purulent iritis.					
Hirschberg.	Scar with incarceration of iris.			Plastic cyclitis.			Detached.			Normal.
Vernon.		Scar in the ciliary region with adhesion of iris.		Scar.	Plastic iritis.	Lens wanting.				

TABLE I. Continued.

II. *Eyes enucleated for sympathetic iritis.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Corneo-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
A. Pagenstecher.				Plastic cyclitis.	Plastic iritis. Ossification of pupillary membrane.		Serous and plastic choroiditis.	Detached.		
Hofr. Pagenstecher.						Lens depressed.	Lens adherent to choroid.	Detached.		
Iwanoff.	Scar with adhesion of vitreus, lens-capsule and iris.		Scar after iridectomy.	Detached. Cyclitis. At one place where a foreign body lies upon it, atrophy.	Purulent iritis.		Detached.			Nerves making part of the scar-tissue. Schwann's sheath thickened.
Handy.	Scar.			Plastic cyclitis. Foreign body in the cyclitic membrane.		Old hemorrhage in vitreo. Lens shrunken, adherent to cornea.		Detached.		

III. *Eyes enucleated for sympathetic irido-cyclitis.*

A. Alt. 22.	Indrawn scar			Atrophy after plastic cyclitis. Detached.	Iris wanting.	Lens wanting.	Detached. Chronic hyperæmia.	Detached around the disc. Atrophy.	Atrophy.	Normal.
Berlin.			Scar from iridectomy.				Melanosarcoma of choroid.		Excavation.	
I. I. Maats.	Scar.					Purulent hyalitis.		Detachment.		
Geo. Lawson.	Scar with prolapse of iris.					Fibrinous exudation in vitreous chamber.	Sero-purulent choroiditis.	Œdema. Proliferation of connective tissue.		

IV. *Eyes enucleated for sympathetic irido-choroiditis.*

A. Alt. 23.			Scar with incarceration of iris.	Purulent cyclitis	Purulent iritis.	Lens wanting.	Hyperæmia.	Partial detachment. Retinitis.	Neuritis optica.	Some fatty degeneration.
24.	Scar with adhesion of iris.			Plastic and purulent cyclitis.	Plastic and purulent iritis.	Traumatic cataract.	Serous choroiditis.	Atrophy.	Hyperæmia.	Normal. One is compressed.

25.			Scar after iridectomy. Adhesion of iris.	Plastic and serous cyclitis. Opposite to the scar detached.	Purulent iritis.	Chalky cataract.	Detached. Ossification.	Detachment.		Normal.
26.			Scar with incarceration of iris.	Purulent cyclitis.	Purulent iritis. Anterior synechia.	Cataract.	Purulent choroiditis.	Purulent retinitis.	Neuritis optica.	Normal.
27.	Scar.			Old plastic cyclitis. New purulent cyclitis.	Purulent iritis.	Cataract.	Purulent choroiditis.	Detachment. Purulent retinitis.	Neuritis optica.	Normal.
28.			Scar with adhesion of iris.	Drawn forward. Plastic and purulent cyclitis.	Purulent iritis.	Lens absorbed.	Purulent choroiditis. Cysts.	Retinitis. Œdema.	Optic neuritis.	Normal.
29.			Scar.	Plastic and purulent cyclitis.	Purulent iritis.	Cataract.	Purulent choroiditis.	Detachment. Atrophy.	Atrophy.	Normal.
30.		Scar in ciliary region. Scleritis.	Scar.	Plastic and purulent cyclitis.	Plastic and purulent iritis.	Purulent hyalitis, mere remnants of the lens.	Plastic and purulent choroiditis.	Detached. Atrophy.	Atrophy.	Normal.
31.			Scar in which iris and ciliary body are embedded.	Plastic and purulent cyclitis. Opposite to the scar detached.	Purulent iritis.	Lens dislocated under the conjunctiva.	Detached. Purulent choroiditis.	Detachment. Atrophy.		Normal.
V. Graefe.	Scar.			Purulent cyclitis.		Chalky cataract.	Purulent choroiditis.	Detachment.	Chalky deposits in optic nerve.	
"			Scar in which ciliary body is embedded.	Torn. Plastic cyclitis.						
Iwanoff.	Scar.				Plastic iritis.		Purulent choroiditis.			
H. Müller.	Scar with incarceration of iris.						Two large cysts between choroid and sclera.			
C. Pagenstecher.				Cyclitis plastica.	Iritis.	Cataract.			Very deep excavation.	
Höring.			Indrawn scar.	Foreign body in ciliary body. Plastic and purulent cyclitis.	Anterior synechia.	Cataract.				
Just.	Scar with incarceration of iris.			Purulent cyclitis.	Purulent iritis.		Detached. Purulent choroiditis.	Detachment.		
H. Pagenstecher.			Scar.	Plastic and purulent cyclitis. Detached.	Plastic and purulent iritis.		Purulent choroiditis.	Detachment.		

TABLE I. Continued.

IV. *Eyes enucleated for sympathetic irido-chorioiditis.*

Number and name of the author.	*Cornea.*	*Sclerotic.*	*Corneo-scleral margin.*	*Ciliary body.*	*Iris.*	*Lens and vitreous body.*	*Choroid.*	*Retina.*	*Optic nerve.*	*Ciliary nerves.*
Bader.				Plastic cyclitis.	Plastic iritis.		Purulent choroiditis.	Hyperæmia. Detachment in periphery.		
Geo. Lawson.	Scar.			Atrophy.	Atrophy.		Atrophy.		Atrophy.	
Arn. Pagenstecher.	Scar.	Round-cell infiltration along the vessels and nerves.		Purulent cyclitis.	Purulent iritis.		Purulent choroiditis.			
H. Müller.				Plastic cyclitis.		New-formed connective tissue in vitreous chamber.	Plastic choroiditis.	Detached and degenerated.		
Arn. Pagenstecher.				Plastic cyclitis.	Purulent iritis. Anterior synechia.		Purulent choroiditis. Sarcoma.	Detachment. Atrophy.		
I. I. Maats.		Scar in which iris, ciliary body, and choroid are embedded.		(Purulent?) cyclitis.		Lens substance absorbed. Hemorrhage in vitreo.	(Purulent?) choroiditis.	Retina wanting.		One makes part of the scar-tissue.
"		Scar in the ciliary region in which iris is embedded.			Plastic iritis. Anterior synechia.					One makes part of the scar-tissue.
Savary.	Scar.	Scar in which choroid and retina lie.				Cataract adherent to the scar. Hyalitis around a foreign body.		Partial detachment.		
H. Knapp.				Plastic cyclitis.	Chronic iritis.	Chalky cataract.	Plastic choroiditis. Ossification.			Normal.
"				Plastic cyclitis.	Plastic iritis.		Plastic choroiditis. Ossification.	Detachment.		Normal.
"				Plastic cyclitis.	Plastic iritis.		Plastic choroiditis. Ossification.	Detachment.		

Geo. Lawson.	Scar.			Plastic cyclitis. Foreign body lying on the ciliary body.				Detachment.		
H. Pagenstecher and C. Genth.	Scar with adhesion of the lens.			Purulent cyclitis. Foreign body in the ciliary body.	Purulent iritis.					

V. *Eyes enucleated for sympathetic affection of the Retina.*

A. Alt. 32.	Scar.			Plastic cyclitis. Drawn forward. Partial atrophy.	Atrophy after iritis with total anterior synechia.		Serous choroiditis.	Detachment. Atrophy and pigmentation.		Normal.
V. Graefe.			Scar after extraction of cataract.	Plastic cyclitis.	Plastic iritis.	Chalky lens dislocated into the anterior chamber.	Plastic choroiditis.			
"							Chronic choroiditis. Chalky deposits.	Detachment.		
J. R. Pooley.			Scar with incarceration of iris and ciliary body.	Purulent cyclitis.	Purulent iritis.		Purulent choroiditis. Partial Atrophy.			Normal.
"	Staphyloma.			Atrophy after plastic cyclitis.	Atrophy.	Small remnants of lens.	Purulent choroiditis. Partial atrophy.	Detachment.		

VI. *Eyes enucleated for sympathetic affection of the Cornea.*

I. I. Maats.				(Purulent?) cyclitis.			Plastic choroiditis.	Detachment.		Some fatty degeneration.
A. Pagenstecher.	Scar (after operation for staphyloma) again staphylomatous.			Plastic cyclitis.	Plastic iritis.	Small remnants of lens.				

	Varieties of sympathetic affections (v. anat. description).						
TABLE II.	I.	II.	III.	IV.	V.	VI.	Total.
Scars in the cornea proper	19	9	3	11	2	1	45
Incarceration of iris in these scars	6	3	1	4	1	1	16
TABLE III.							
Scars in the sclera proper	13	1		4			18
Scars in the ciliary region with incarceration of ciliary body, or choroid, or both	6	1		3			10
Staphyloma	3						3
TABLE IV.							
Scars in the corneo-scleral margin	14	4	1	10	2		31
Incarceration of a part of the uveal tract in these scars	7	3		6	1		17
Of these scars the following are due to a previous operation	5	2	1	1	1		10
Incarceration of a part of the uveal tract in these	2	1		1			4
TABLE V.							
Affections of the ciliary body	38	13	1	26	4	2	84
Plastic cyclitis	19	8	1	17	3	1	49
Purulent cyclitis	11	3		14	1	1	30
Atrophy	1	3	1	2	2		9
Wounds and foreign bodies	10	2		3			15
Tearing and detachment	8	3		4	1		16
TABLE VI.							
Affections of the iris	35	11	1	23	4	1	75
Purulent iritis	9	6		13	1		29
Total anterior synechia	3	1		4	1		9
Total posterior synechia	6	3		7	1	1	18
Atrophy	5	2		1	2		10
There were irido-dialysis once, and irideremia three times.							
TABLE VII.							
Affections of the lens and vitreous body	39	5	2	15	2	1	64
Chalky cataract	2	1		3			6
Dislocation of lens	4			1	1		6
Lens wanting	5	2	1	1			9
Foreign body in it	5	2					7

	Varieties of sympathetic affections (v anat. description).						
TABLE VIII.	I.	II.	III.	IV.	V.	VI	Total.
Affections of the choroid	38	12	3	23	4		81
Purulent choroiditis	6	2	1	13	2		24
Plastic choroiditis, ossification, chalky deposits.	8			3	1		12
Atrophic choroiditis	4	2		1	1		8
Detachment of choroid	8	2		4			14
Tumors of choroid			1	1			2
TABLE IX.							
Affections of the retina	45	9	3	20	3	1	81
Detachment	33	8	2	17	3	1	64
TABLE X.							
Affections of the optic nerve	14	6	1			1	33
Optic neuritis	2	1		5			9
Atrophy after neuritis	6	4		4	1		15
Glaucomatous excavation	5			4			9
Granuloma optici intraoculare traumaticum existed in one instance.							

The histological condition of the ciliary nerves has been mentioned in forty-three of the cases.

They are normal thirty-four times.

Torn and compressed *without* histological changes three times.

They enter into the formation of the cicatrix four times.

They are in a process of fatty degeneration or atrophy three times.

Schwann's sheath was found thickened three times, and containing chalky deposits once.—

Decided purulent panophthalmitis was found in twenty-one instances.—

The time which elapsed between the affection of the eye first diseased, and the appearance of sympathetic symptoms in the other eye has been mentioned in fifty-eight of the cases. It is severally :

TABLE XI.

Number of days.	Number of cases.	Number of years.	Number of cases.
7	1	3	4
8	2	5	3
Number of weeks.		6	1
		7	3
2–5	7	12	2
5–9	7	13	1
Number of months.		14	2
		17	1
2	4	20	1
3	2	25	1
4	1	27	1
5	1	29	1
6	3	30	1
10	2	40	1
Number of years.		45	1
		50	1
2	2	60	1
			58 cases.

Thus the percentage of cases, in the first two months, 36⅓ per cent.; between the end of the second month and the first year, 15½ per cent.; between the end of the first and tenth year, 22¾ per cent.; between the end of the tenth and twentieth year, 12 per cent.; between the end of the twentieth and the sixtieth year, 13⅓ per cent.

Sympathetic affections resulting from extraction of cataract..... 5 times.
Reclination..... twice.
Iridectomy..... 3 times.
Division of soft cataract..... once.

Idiopathic inflammation without preceding traumatism of the globe was the cause in 16½ per cent. of the cases. Corneal or scleral cicatrices, with incarceration of a part of the uveal tract, are found in 39 per cent. Affections of the entire uveal tract, or of a part of it, exist in 99 per cent. of the cases and a fraction; purulent panophthalmitis in 19 per cent. Affections of the optic nerve and retina in 79 per cent., among which detachment of the retina in 58 per cent. Detachment of ciliary body and choroid in 20 per cent. Histologico-morbid alterations of the ciliary nerves were observed in but 16⅔ per cent. of the cases. Only one case presented but a retinal affection. 73 per cent. had affec-

tions of the uveal tract and the retina. In 27 per cent. of the cases the uveal tract was affected without a retinal complication.

The symptoms of sympathetic *irritation*, which are described by all authors as photophobia, lachrymation, paresis of accommodation, pain, and photopsia, appeared in 52 per cent. of the cases. 98 per cent. of these cases had affection of the uveal tract; 90½ per cent. affections of the retina and optic nerve.

Sympathetic *iritis* had set in in 13⅔ per cent. In 100 per cent. of these cases the uveal tract was affected; the retina and optic nerve in 62 per cent.

Sympathetic *irido-cyclitis* was observed in only FOUR (!) of 110 cases (3¾ per cent.). The enucleated eyes presented affections of the uveal tract 3 times, and of the retina and optic nerve 4 times.

Sympathetic *irido-choroiditis* had set in in 27⅓ per cent., in all of which the uveal tract was affected. Purulent panophthalmitis occurred in 43⅓ per cent. of these cases. The retina and optic nerve were affected in 73⅓ per cent.

But 5 eyes (4½ per cent.) were enucleated for sympathetic *neuroretinitis*. The uveal tract was affected in all, and the retina and optic nerve three times—60 per cent.

Only 2 globes were removed for sympathetic affections of the *cornea* (1 $\frac{9}{11}$ per cent.).

Conclusion.

The above statistics show the cause of the sympathetic affections, necessitating enucleation, to be traumatisms in 83½ per cent. cases, leaving 16½ per cent. of the cases attributable to idiopathic inflammation. In 39 per cent. of the 110 eyes, we encounter injuries to the hard membranes, with incarceration of a part of the uveal tract, *i. e.*, in 62¾ per cent. of all the injuries. Among those eyes which were destroyed by idiopathic inflammation, ⅔ presented ulcerations of the cornea, with incarceration of the iris, or the formation of staphyloma. Consequently, the percentage of eyes which were the cause of sympathetic troubles, without presenting cicatrices in the hard membranes, is very small (about 5 per cent.); and among these should be especially cited those with chalky deposits and ossifications. In 44½ per cent. the cases of injury to the hard membranes no part of the

uveal tract was attached to the wound. These cicatrices are always combined with internal changes. Cicatrices and foreign bodies in the ciliary body or incarceration of it—which are usually looked upon as the most important factor in sympathetic affections—appear in only 17¼ per cent., while the affections of the ciliary body all together amount to 76½ per cent. The iris is changed in but 68 per cent. and the choroid in 73 per cent., thus showing almost the same number of changes in each of the parts of the uveal tract, with only a slight percentage in favor of the ciliary body.

The percentage of changes in the retina and the optic nerve is remarkably great—79 per cent.; of the retina alone 73 per cent.; and in 58 per cent. of these the retina is detached. Notwithstanding the fact that there is but one case described in which there was an affection of the retina without coincident affection of the uveal tract, it appears to me that the great percentage of affections of the retina and optic nerve should engage very earnest consideration—the more so, as there are but 16⅔ per cent. which present changes in the ciliary nerves.

What part transmits the affection from one eye to the other? If it were the ciliary nerves, diseased in structure or function, v. Graefe's proposition to divide them should have led to a favorable result. If it were the inflamed optic nerve and retina, the section of the optic nerve would have proved more successful. From the preceding statistics I conclude that the views of many earlier authors—*i. e.*, that the optic nerve plays a great part in the transmission of sympathetic ophthalmia—is strongly sustained, and its action in this respect is attributable as much to inflammatory as to functional changes. Transmission of inflammatory changes appears quite possible, if we bear in mind the semidecussation of the optic nerve-fibres in the chiasm, as demonstrated by the cases of *Iwanoff*, *Hirschberg*, *Pooley*, and others, while Mooren (Symp. Gesichtsstörungen) gave the supposition of functional changes a very plausible explanation; but it seems to me that he underrates the influence of the optic nerve. The transfer of affections by the ciliary nerves can only be accomplished by reflex action, since their tissue possesses a great power of resistance. (See H. Müller.) It appears to me that the entire nervous apparatus of an eye has the power of transmission; and even the influence of the sympa-

thetic system must not be left out of view in this consideration. In more than 99 per cent. of the cases we have to deal with changes in the vascular membrane of the eye—consequently with disturbances of the entire circulatory system. It is hardly presumable that these disturbances should not exert an influence upon the sympathetic fibres of the uveal tract.

The individual varieties of sympathetic affections in the second eye are certainly nothing but differences of degree. I do not now allude to the two eyes, enucleated for sympathetic corneal affections, although Galezowsky, too, cites two such cases. They appear doubtful to me, to say the least. There can be no incontrovertible assertion, that the locality of the primary affection would determine a certain fixed kind of affection in the other eye. Still it is worth mentioning that in 13 of the cases where eyes were enucleated for sympathetic *irido-choroiditis*, the other had been lost by *panophthalmitis purulenta*, and that of the five, enucleated for *neuroretinitis sympathica*, three showed retinal detachment.

FROM THE FOREGOING WE MAY DERIVE THE FOLLOWING PRACTICAL DEDUCTIONS:

1. The entire nervous apparatus of the diseased eye participates in the transmission of the affection to the other.

2. Scars in the hard membranes, whenever combined with alterations in the other parts of the eye, particularly in the uveal tract, retina or optic nerve, are capable of calling forth sympathetic affections of the other eye, at any time.

3. Purulent panophthalmitis makes no exception.

4. Consequently its artificial production, as a prophylactic measure against sympathetic affection, is reprehensible.

5. The time at which sympathetic affections most frequently manifest themselves varies between seven days and eight weeks, after the beginning of the disease of the first eye.

6. As soon as the first trace of a sympathetic affection manifests itself (a diagnosis which should be made with the greatest care), therapeutic measures should be resorted to.

7. The only efficient means consists in enucleation of the eye first affected.

8. When it is fairly presumable that the affection has extended

to the optic nerve, the removal of a large piece of the nerve, together with the globe, should not be omitted.

9. Should a case come under our treatment in which the iris or capsule of the lens is incarcerated, the incarcerated iris or capsule should be freed before sympathetic irritation has made its appearance. In recent cases an abcission of the prolapse, with or without iridectomy, will obviate, in most cases, the impending danger of sympathetic ophthalmia.

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